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Stock Without Par Value

In his presidential address before the Wisconsin Electrical Association, Mr. William H. Winslow suggests the device of issuing stock without par value to encourage new public utility enterprises. His recommendation is based on his conclusion that the public utility and stock and bond laws, although beneficial for established utilities, have made the financing of new enterprises difficult or impossible. This is in general the effect of strict regulative laws. Rightly administered they tend to give stability to established properties, but this does not help the small struggling communities that would rather pay a high price in a return on inflated capitalization than to be without service. Many communities wanting such service have cheerfully paid rates that permitted interest on bonds representing the approximate full cost of the property, and in addition a return on stock issued partly or wholly as a bonus to underwriters. Mr. Winslow's suggestion in effect is that stock without par value be substituted for the stock issued with par value under former methods. It is open to question, however, whether a strict regulating commission would permanently permit a schedule of rates high enough to provide earnings on stock that had no admitted or claimed value or whether it would sooner or later restrict earnings closely to a return on actual value. That, however, is a question for promoters to reckon with. If they are satisfied to take chances on stock without par value, as they formerly did in many cases on stock with par value but without much if any actual value in physical property, the industrial development of the smaller class of communities is sure to be furthered.

Putting the Cards on the Table

Nothing is so effective in removing mutual distrust as full, frank and free discussion. A symposium of this sort characterized the "open session" of the recent Milwaukee meeting of the Contractors' Association of Wisconsin. Representatives of the contractors, large supply dealers (or jobbers, as they are often called), manufacturers and consulting engineers told one another candidly why their relations were not altogether satisfactory, and pointed out remedies. At times the remarks made in the running debate were sharp and pointed, but the general result of the discussion was decidedly salutary. After it was over it was apparent that everybody felt better. The men taking part in the discussion relieved their minds and gained something of the other fellow's point of view. The meeting ended with a more sympathetic understanding of the difficulties encountered in the various branches of the industry. It was somewhat as though a storm had freshened the atmosphere. The main complaint of the large dealers was that the contractors now place their little emergency orders with them and give their big orders to the manufacturers. The contractors on their part complained that the large dealers encourage the irresponsible so-called contractors or "curbstoners," by eagerly seeking their business at the same prices as are offered to the legitimate contractors. It was also charged that the dealers sell directly to large consumers, thus invading the field of the contractors. No definite action was taken at the meeting, but there seemed to be some progress toward a recognition of the fact that both the legitimate contractor and the large supply dealer have a place in the electrical industry and that each should recognize and respect the rights of the other.

Real Co-operation in Wisconsin

One pleasant and encouraging feature of the last two conventions of the Wisconsin Electrical Association has been the practical co-operation manifested by the Railroad Commission of Wisconsin. The commission made valuable educational exhibits at both of these conventions and the central-station men profited by them. In addition, engineers, accountants and employees of the commission attended the convention in considerable numbers, took part in the discussions, explained the exhibits and mingled with the electrical men present, making clear the work of the commission to all interested—and all the Wisconsin central-station men are very much interested. Mr. C. M. Larson, chief engineer of the commission, recently read a paper on "Street Railway Traffic Surveys," and Mr. Halford Erickson, member of the commission, honored the association by preparing for it a paper entitled "Some Facts Relating to Depreciation and Rate-Making." The commissioner mentioned the fact that there is a considerable demand on the part of the public for a uniform meter rate, but he showed how such a flat rate would tend to reduce the profits of the electric-service utilities and to increase the prices that they would have to charge. He also showed that such rates would tend to keep the central station from entering into the industrial development of the day and would undoubtedly be disadvantageous to the public, although the prospect of a uniform flat meter rate, such as is made in the case of the gas and water service, is an alluring one to the average citizen. The relations of the state commission and the state association of central-station men in Wisconsin are admirable and worthy of emulation in all states having

public utility commissions. The electrical men recognize the high character of the Wisconsin commission and the spirit of justice which pervades it. They are striving earnestly to comply with the commission's requirements, and in its turn the commission talks things over with the utility men and does not put any new regulations into effect without first giving the men vitally affected an opportunity to present their views of the situation.

The Resistivity of Copper

The increase of resistivity in copper with rise of temperature between the freezing and boiling points of water is a very definite phenomenon. While it has many drawbacks, such as the increase in joulean losses as the temperature of a dynamo-conductor rises, yet it has a few counterbalancing advantages. One of these is the facility afforded for determining the mean change of temperature of a coil as a function of the change in its electric resistance.

We know that in the case of standard commercial copper the resistivity between 0 deg. and 100 deg. C. follows a straight-line law, such that the resistivity would fall to zero at — 234.5 deg. C. That is, the resistivity of standard copper between these temperature limits is directly proportional to the virtual absolute temperature of the metal, the absolute temperature of gas pressure being at — 273 deg. C. and the virtual absolute temperature of copper resistivity being at — 234.5 deg. C. In rising, therefore, from a temperature of 20 deg. C. to a temperature of 50 deg. C., the resistivity increases in the ratio 284.5 : 254.5. Of course, this absolute zero of resistivity at — 234.5 deg. C. is fictitious, because measurements have shown that the resistivity is small, but quite appreciable, at that low temperature. This means that the curve deviates from the straight line at low temperature.

In the January number of the *Journal of the Franklin Institute* Dr. Edwin F. Northrup publishes a series of measurements on the resistivity of copper from 20 deg. to 1450 deg. C. The experimental difficulties in the way of securing accurate measurements at such high temperatures are considerable. The results indicate that the straight-line law of resistivity from a fictitious zero at — 234.5 deg. C. substantially persists up to say 500 deg. C. Thereafter the curve becomes somewhat steeper, but does not greatly deviate from a straight line until the temperature approaches the melting point of copper, which is in the neighborhood of 1080 deg. C. In changing from the solid to the liquid state the resistivity jumps up suddenly and roughly doubles itself within a few degrees. Finally, from 1100 up to 1450 deg. C., the highest temperature attained, the resistivity of liquid copper again conforms to a rising straight line substantially parallel to that below the melting point.

The curve of resistivity ordinates versus temperature abscissas over the range here considered is thus reported to be nearly a straight line throughout, except for a sudden jump of resistivity on a nearly constant temperature, in rising through the melting point, thus producing a pair of parallel slopes with a precipice between them. The results, assuming them to be reliable, add considerably to our knowledge of copper resistivity. The abrupt doubling up of the resistivity at the melting point which was encountered both on rising and falling temperatures ought to be useful in securing automatic regulation of temperature in the neighborhood of 1080 deg. C., since the sudden increase in resistance of a properly protected copper conductor might serve to cut off heat from an electrically operated furnace system.

Sag-Temperature Relations in Suspended Conductors

The increasing use of tower construction for supporting high-tension transmission lines has caused engineers to devote much attention to the science of sags and spans. The conductors have to be erected in position without unnecessary slack, in such a manner that they shall not be stressed beyond the elastic limit when the temperature falls to the winter minimum, with a reasonable load of sleet on the wires and with a reasonably strong wind blowing across the line. This means that the constructing gang must be provided with definite information as to the tension to be placed on the conductors over a given span and at a given temperature.

It is fairly easy to compute the sag which must be allowed in a given span, for a given size of conductor, in order that an assigned tension may be attained in the span. The matter becomes more complicated, however, when sleet, wind and changes of temperature have all to be taken separately into account. The degree of complexity depends also upon the geometrical assumptions concerning the form of the suspended conductor. Strictly speaking, this form is a catenary curve, or the form of a freely suspended perfectly flexible uniform chain suspended between the two given tower crossarms. In practice there is ordinarily so little difference between the catenary and parabola that the latter is nearly always assumed for simplicity.

The article by Mr. H. M. Hall appearing in this number introduces a new property of a suspended wire; namely, the sag which will occur at 0 deg. Cent., after the sleet load has melted off and the transverse wind has disappeared. This release sag is presented as a very simple factor in the initial sag which would correspond to the elastic limit. From the release sag the effects of temperature change can be readily deduced, with the aid of a graphical process. The assumptions are that the wire hangs parabolically between two supports at the same level and that the tension is uniform at all points in the span, so that Hooke's law of extension may be considered to apply. The difference between the length of wire in the span and the horizontal distance between supports is also ignored. All of these

propositions may be regarded as substantially met in ordinary span construction. Various methods have been presented in the past for attacking the problem above indicated. In practice they all lead to sets of working tables, or curves, from which the required information can be derived by the line foreman. The methods thus far developed differ chiefly in regard to the steps by which the working tables or curves are arrived at.

The President and Industry

President Wilson's message is pacific in tone. At the same time it expresses many of the radical proposals that have been made in recent years. There is no inveighing against business, no picture of business as an enemy. Instead, Mr. Wilson happily assumes that he is talking with and for the best business ideas of the day, arising from business men themselves. This spirit promotes consideration of his measures. It arrests condemnation until their meaning and effect can be definitely understood. It fosters the co-operative attitude which alone can make the presidential policies a success and an inspiration to trade and industry. The language in which these policies make their appearance is necessarily general on some points. The concrete expressions will come in the bills that Congress will consider or pass to make the recommendations effective. Comment, therefore, is restricted to the general terms used by the President until such time as more explicit language appears in laws, potential or actual.

Passing the reassurances to business to which one-third or more of the message is devoted, we find the President's declaration that the program is founded upon the conviction that " 'private monopoly is indefensible and intolerable.' " As in the previous utterances of Mr. Wilson, there is no definition of monopoly, but he thinks that a definition by statute, item by item, is possible. Manifestly it is monopoly in trade and manufacture which is criticised, not monopoly in public utility service, the wisdom of which is generally admitted. Where the statute fails to give the needed light the President would rely on an interstate trade commission. Presumably there would be, as there should be, a sharp line to show where the judicial processes of the law end and the administrative processes of the commission begin. "Further and more explicit legislative definition of the policy and meaning of the existing anti-trust law" is urged. If the law is made more definite, the duties of the new commission will be lessened. That is desirable because the jurisdiction of this commission will be so wide and the problems seeking solution so many that the burden laid upon it will be heavy. It will take over duties now performed by the Attorney-General, who, without specific authority of law but in the absence of any governmental body delegated to act, has dealt with corporations accused of infractions of the statute. In the suggestion that the commission will administer corrective processes when dissolution becomes necessary we find the administration opinion that such processes will be necessary. However, if the trade commission holds its rightful place in our economic structure its functions will be less in destructive processes than in construction of upbuilding trade practices. The commission cannot create enterprise and ability where the germs of these qualities do not lie. But it can develop policies to promote wholesome business as well as policies to tear down unwholesome practices. If it does not exercise as much courage in the one direction as it will be likely to create discouragement in the other, it will fail to be the helpful factor in business that it ought to be.

It is a surprise to read the President's declaration that "we are agreed that holding companies should be prohibited." Speaking for ourselves, we are not by any means agreed on that if the prohibition is intended to apply to all forms of holding companies. Some of these have great powers of economy and efficiency. If rightly managed, they are an agency for good to the public. Nor do we see how, with proper management, holding companies controlling widely separated public utilities can be inimical to the public interest. The electrical central-station industry is full of examples of cases where holding companies control plants without physical connection, without even geographical nearness, and consequently without possibility of competition. The plants are not more monopolistic than if they were owned and operated independently, and monopoly of the service they render in each community is in the public interest. Like every other good agency, the central-station holding company is liable to abuse. But its advantages are many and it should not be done away with lightly. If the law is to regulate such properties, it ought to do so with the object of preventing misuse and of preserving existing and future advantages due to centralized production, transmission and management. It is conceivable that the President's policies are designed to apply to trade and not to public utilities, but if so the laws which are likely to follow should explicitly so state.

It is, of course, impossible to read out of the President's message the definite proposals which he has made for a vastly greater extension of governmental power over trade and industry. It is equally impossible, however, to read out of the message the spirit of "peace, honor, freedom and prosperity," to use his words, in which he seeks, according to his judgment, to better business practices. It is impossible to accept the regulation and ignore the hand that goes with it. If Congress will keep the atmosphere of the message and not only the rigorous proposals, it will help business over the pending changes without loss to itself and with benefit to the country. Mr. Wilson's remarks concerning the fatal effect of uncertainty on business, applied by him to the immense area of uncertainty left by the present anti-trust law, may well be heeded by Congress. Congress should be spurred to act without unnecessary delay on such corrective legislation as is needful, but it should first hear and weigh carefully the views of business men affected.

The News of the Week

**Activities and Events in the Electrical Field—
Reports of Meetings—Commission Findings, Etc.**

The President's Message on Industry

President Wilson read his message on business to Congress on Jan. 20. Extracts from the message follow:

"What we are purposing to do is, happily, not to hamper or to interfere with business as enlightened business men prefer to do it, or in any sense to put it under the ban. The antagonism between business and government is over."

"The government and business men are ready to meet each other half way in a common effort to square business methods with both public opinion and the law."

"Fortunately, no measures of sweeping or novel change are necessary. It will be understood that our object is not to unsettle business or anywhere seriously to break its established courses athwart."

"These are the changes which opinion deliberately sanctions and for which business waits:

"Laws which will effectually prohibit and prevent such interlockings of the personnel of the directorates of great corporations as in effect result in making those who borrow and those who lend practically one and the same.

"A law which will confer upon the Interstate Commerce Commission the power to superintend and regulate the financial operations by which the railroads are henceforth to be supplied with the money they need for their proper development.

"Further and more explicit legislative definition of the policy and meaning of the existing anti-trust law.

"Something more than the menace of legal process in these matters . . . the advice, the definite guidance and information which can be supplied by an administrative body, an interstate trade commission. The opinion of the country would instantly approve such a commission.

"We are agreed, I take it, that holding companies should be prohibited. This question I venture for your consideration."

Massachusetts Public Service Commission Overruled on Bond Issue

The Supreme Court of Massachusetts has handed down a unanimous decision rendering void the recent order of the Public Service Commission which approved the petition of the New York, New Haven & Hartford Railroad for authority to issue $67,552,000 in convertible debenture bonds. The court particularly disapproved of the proposed convertibilty of the bonds into stock at some future date and said in part:

"The approval by the commission of an issue of stock must relate to the present and not to a remote future. This is required by the legislative intent disclosed by a review of the statutes. The amount of stock which the commission intelligently can approve to be issued is inseperable from the price at which it is to be issued. The price at which the public interest may require that it be issued during a period of ten years beginning five years hence is impossible of ascertainment now. But the approval of convertible debentures with the right to take stock at par in payment during that period involves fixing a price of the stock during the like period. An order entered now that stock be issued at par during that period of time can afford no security that the corporation will get an adequate return for its stock, or that rates and charges fixed upon such a capitalization will be fair, or that the rights of other stockholders will be guarded properly."

New York State and Niagara Power

Representatives of New York State have appeared before the foreign affairs committee of the House of Representatives at Washington to ask for greater rights in the development of water-power and the control of power companies at Niagara Falls than are now held. A bill is pending before the committee permitting the Secretary of War to divert 4400 cu. ft. of water per second from the American falls at Niagara and to say by whom and for what purposes this water may be used. Governor Glynn of New York has written to the committee contending that the functions of the federal government end with permission to divert the water, and that the power to be created is solely the property of New York State. Governor Glynn declared that it is his fondest hope as Governor to inaugurate a State-wide policy for the utilization of all available water-powers of the State for the benefit of the whole people. He expressed the opinion that a law dealing with the subject will be passed at the present session of the Legislature.

Franchise Negotiations in Cincinnati

At a meeting of the committee on light of the City Council of Cincinnati Mr. W. W. Freeman, vice-president of the Union Gas & Electric Company, urged that the old schedule of rates be retained for another period of ten years. He said that the schedule is fair and that only five large cities, in which water-power is used for generation, have a more favorable rate. He also stated that the company has completed plans for the construction of a new plant on the river front which will require an investment of $7,500,000 and that, unless assurance is given that a reasonable return for this money will be allowed, it will be impossible to proceed with the improvement. The present maximum rate is 11 cents per kw-hr., but Mr. Freeman said that the maximum really charged is 10 cents. The average rate is approximately 5 cents.

Former City Solicitor Bettman argued that, while all wanted to allow the company a fair rate of income, a temporary contract should be made until the Public Service Commission can make a valuation of the property and determine the cost of production. He said that the fact that the company is arranging to build a new plant is argument enough against the renewal of the old contract. The introduction of new machinery,

he said, may greatly reduce the cost of production and the people will not benefit from the improvements. The modern doctrine, he contended, is against long-term franchises of any kind.

Mr. Freeman said that the Council should be willing to place the company in a position where it could have the credit of reducing the rates, if it becomes possible to do so, instead of attempting to force down the rates at present, when it is impossible to say what can be done in the future.

Southern Hydroelectric Developments Nearing Completion

Mr. G. G. Shedd, in an address before the meeting of the American Association for the Advancement of Science held in Atlanta, Ga., recently, described two Southern hydroelectric developments which have been in course of construction for about eighteen months. The development at Stevens Creek, on the Savannah River, about 8 miles from Augusta, Ga., will be in operation shortly and will develop 31,000 hp for the Georgia-Carolina Power Company. The station is designed to supply the market around Augusta, where many industrial plants are situated. A dam 2700 ft. long creates a lake of 4200 acres, extending 14 miles up the Savannah River. Navigation will not be interfered with, but will be improved by a lock 30 ft. wide and 150 ft. long, which has a lift of 27 ft. and which will give 6 ft. of water at all stages of the river. Generating equipment with a rating of 15,600 hp. has already been installed, and a complete system of transmission lines and substations has been built.

The second development, which will also be in operation this month, is that of the Parr Shoals Power Company at Parr Shoals, on the Broad River, 27.5 miles from Columbia, S. C. There is a dam 2740 ft. long, thrown across the river, a generating station designed for eight units with an aggregate rating of 29,000 hp, and a double-circuit steel-tower transmission line, 26 miles long, and a substation at Columbia. The latter will also be used as a distributing station for energy from the present hydroelectric and steam plants of the Columbia Railway, Gas & Electric Company. All the energy generated by these two stations and by the Parr Shoals hydroelectric plant will pass through the new station. The Stevens Creek and the Parr Shoals developments were started in June 1912. Mr. E. W. Robinson, of Columbia, S. C., is president of the Parr Shoals Power Company and Mr. J. H. Pardee, of New York, is president of the Georgia-Carolina Power Company.

Western Red Cedar Association

The Western Red Cedar Association held its annual meeting at Spokane, Wash., Jan. 12. In addressing the association, President H. C. Culver commented on the recent inactivity in the pole industry but predicted a more healthy condition during 1914. Stocks are not large, he pointed out, but they are fairly well assorted. Owing to lack of snow the output during the present winter will be greatly restricted. In the United States alone, said Mr. Culver, there are 800,000 miles of pole lines carried on 32,000,000 poles, for which 4,000,000 poles are required annually for renewals. Of the above large figures, cedar poles comprise about 65 per cent.

Steps were taken to urge the National Electric Light Association to adopt the cedarmen's classifications for Western red-cedar poles. Officers were elected as follows: President, Mr. M. P. Flannery; vice-president, Mr. W. M. Leavitt; secretary-treasurer, Mr. W. L. Bayne, and directors, Messrs. R. G. Jones, H. C. Culver and C. P. Lindsley.

Convention of Heating and Ventilating Engineers

More than 200 members of the American Society of Heating and Ventilating Engineers attended the annual meeting of the society held at New York Jan. 20, 21 and 22. Among the papers presented were the following: "Work of the Ventilation Division, Chicago Health Department," Dr. E. Vernon Hill, Chicago; "Heat Transmission in a Pressed-Steel Radiator," Prof. John R. Allen, Detroit, Mich.; "Flow of Steam in Pipes," Mr. W. F. Verner, Ann Arbor, Mich.; "Cooling Rooms in Residences and Hospitals," Mr. A. M. Feldman, New York; "Life of Building Power Plants," Mr. A. M. Ripley, New York; "Heating Practice in France," Mr. Gustave Debesson, Paris, France; "Heating Practice in Sweden," Mr. H. G. T. Theorell, Stockholm, Sweden, and "Heating Practice in Germany," Mr. W. E. Müllenbach, Hamburg, Germany.

Mr. S. R. Lewis, Chicago, was chosen president of the society for the ensuing year; Messrs. E. F. Capron, Chicago, and D. D. Kimball, New York, were elected vice-presidents, and Mr. J. A. Donnelly, New York, treasurer. The new directors chosen were: Messrs. J. F. Hale, Camden, N. J.; W. W. Macon, New York; John R. Allen, Ann Arbor, Mich.; F. E. Chapman, New York; J. M. Stannard, Chicago; F. G. McCann, New York; E. I. Cooper, Boston, and H. M. Hart, Chicago.

Wireless Transmission

On Jan. 19 Prof. Elihu Thomson, of Lynn, Mass., delivered an illustrated lecture before a joint meeting of the New York Electrical Society and the New York Companies' Section of the National Electric Light Association on the "Wireless Transmission of Electrical Energy." He pointed out in a simple manner how radio-communication phenomena resemble and differ from the laws of propagation of Hertzian waves. He also showed wherein the electrostatic flux propagated from a wireless antenna differs from that emitted by a Ruhmkorff coil fitted with an oscillator, and how it resembles that surrounding a transmission wire. By considering the wireless station antenna as one-half of an oscillator—the other half being the "image" below the earth's surface—and the earth's surface as a conducting film he showed why the electrostatic waves follow the curvature of the earth instead of being propagated in straight lines as was predicted at first.

The mutual interference of waves emitted from a single source was explained by saying that some of the electrostatic flux follows short-cuts around obstacles, and as the wave-lengths remain the same it is possible that waves which finally join may be out of phase.

Professor Thomson advanced an interesting theory to account for the relative difficulty in transmitting in daylight at high frequency, as compared with night-time or low-frequency transmission, which was based on the ionization by sunlight which sets free negative charges, thereby diminishing the value of the impulse received at the distant point.

When the frequency is high a positive wave reaches the territory of free negative charges before these have time to become dissipated, and they combine with an equal number of positive charges, thus further weakening the wave.

Professor Thomson said that by raising the voltage

and thus increasing the amplitude of the wireless wave longer-distance wireless communication can be obtained. The corona loss which now occurs on antennas with high voltages can be eliminated by constructing large-diameter cylindrical towers with large balls supported at the top.

In closing, Professor Thomson stated that he believed efficient transmission of energy for industrial purposes would always require a conductor core to guide the energy to its destination.

Electric or Gas Lighting for Indianapolis Parks and Boulevards

An investigation has been begun by the Indianapolis Board of Park Commissioners into the relative merits of gas and electric lighting for park and boulevard lighting. A contract for lighting the parks and boulevards with gas has expired and the board has continued the gas lighting from month to month by contract. It is believed, however, that some of the commissioners now favor electric lighting.

Meeting of New York State Contractors

The New York State Electrical Contractors' Association held its midwinter meeting on Tuesday, Jan. 20, at Shanley's Restaurant, 117 West Forty-second Street, New York. The morning session was devoted to a closed session for members only. Following a luncheon an open meeting was held at which a number of manufacturers were also present. Mr. J. M. Wakeman, general manager of the Society for Electrical Development, delivered an address relating to this society. Mr. T. I. Jones, chairman of the Commercial Section of the National Electric Light Association, delivered an address on the work of that section. An informal reception was held immediately after this meeting, followed by a theater party and supper in the evening.

Brooklyn Company Section Meeting

Mr. T. I. Jones, chairman of the Commercial Section of the National Electric Light Association and general sales agent of the Edison Electric Illuminating Company of Brooklyn, delivered on Jan. 12 his annual address before the Brooklyn Company Section of the N. E. L. A. on the developments in the electrical field in Brooklyn during 1913. More than 700 members of the section and a number of out-of-town visitors connected with the industry turned out to listen to Mr. Jones's talk, which was illustrated with lantern slides covering specific installations to show the trend toward the use of electricity in Brooklyn homes, factories and stores. One feature brought out was the fact that within the limits of Brooklyn there are a number of farms that are completely equipped for electric service, including motors for cow-milking machinery.

Following Mr. Jones's talk short addresses were made by a number of the visitors present, among whom were included Messrs. T. Beran and H. H. Barnes, of the General Electric Company, New York; Messrs. C. G. M. Thomas and C. A. Barton, of the New York & Queens Electric Light & Power Company, Long Island City; Messrs. P. S. Young and R. R. Young, of the Public Service Electric Company of Newark, N. J.; Messrs. C. A. Littlefield and A. A. Pope, of the New York Edison Company; Messrs. W. J. Clark and W. L. Secord, of the Westchester Lighting Company, Mount Vernon, N. Y.; Mr. L. A. Coleman, of the United Electric Light & Power Company, New York; Mr. C. A. Greenidge, of J. G. White & Company, New York, and Mr. L. R. Wallis, of the Edison Electric Illuminating Company of Boston.

Preceding Mr. Jones's address Mr. E. A. Leslie presented a paper entitled "Central-Station Service for Manufacturers." Mr. Leslie's paper was well received and brought forth spirited discussion from a number of members. Those who participated in the discussion were Messrs. T. Bates, F. L. Leitner, J. L. Wiltse, W. H. Grove, G. J. Leibman and C. H. Stevens. The evening's session was closed with an excellent vaudeville entertainment by employees of the Edison company.

Annual Dinner of the Ithaca Section, A. I. E. E.

The seventh annual dinner of the Ithaca Section of the American Institute of Electrical Engineers was held on Saturday evening, Jan. 17, with Messrs. B. A. Behrend and F. C. Henderschott as the out-of-town speakers. Nearly a hundred local members and guests were in attendance. The meeting was opened by Chairman E. L. Nichols, who introduced the toastmaster, Prof. C. F. Hirschfeld, in charge of instruction in gas-power engineering in Sibley College. Mr. Behrend was the guest of honor, and he gave a stimulating address on the relation of the industries to their workers. He also emphasized the importance of considering engineering problems as a whole as well as in individual parts. It is possible, said he, for the solution of a great problem to be perfect in each detail, considered separately, and yet a failure as a whole. This is true in social problems as well. He argued for the highest possible development of the individual as the chief element of social success.

Mr. Henderschott explained briefly the organization of the National Association of Corporation Schools, which is now an assured success. This was described in detail in his paper delivered before the Institute at the Cooperstown meeting. Prof. S. O. Orth, of the department of political science at Cornell, made an eloquent plea for the cultivation of the emotional side of the engineer's nature if he is to be a real success. Director A. W. Smith of Sibley College congratulated the Ithaca Section upon the prospects ahead in view of the successful efforts made and being made for the conservation of our national resources, particularly of human life. Prof. Frederick Bedell, of the department of applied electricity, gave many amusing quotations from early writers on electricity and magnetism, showing the lack of the scientific spirit and contrasting this with the point of view of Dr. Gilbert, to whom he referred as the great exponent of the scientific spirit. Prof. H. H. Norris, formerly head of the electrical engineering department, gave some results of observations made during a recent tour in which many colleges were visited, pointing out that the vital element in a successful curriculum is not so much what is studied but how each study is approached. He suggested that every part of the college course should be treated as a problem.

Several of the speakers referred to the desirability of nominating Prof. Harris J. Ryan for the presidency of the Institute in 1915, and the suggestion aroused a hearty response. As a center of Institute activity next year will be in California, it was considered appropriate that a man so well and favorably known from coast to coast and now a loyal Californian should thus be honored by the Institute and at the same time have given to him an exceptional opportunity to serve it.

Louisville Company Invites Publicity

The Louisville (Ky.) Gas & Electric Company has notified the People's Protective League of that city, which is planning a legal fight to dissolve the merger company, that its books are open to any committee authorized to investigate its affairs. The league opposes the terms on which the merger of public-service companies in Louisville was permitted.

Work on Panama-Pacific International Exposition

The accompanying illustration shows a part of the main exhibit section of the Panama-Pacific International Exposition to be held in San Francisco in 1915 in celebration of the official opening of the Panama Canal. The photograph gives an excellent idea of the present state of the site chosen for the celebration. The grounds

PANORAMIC VIEW OF PANAMA-PACIFIC INTERNATIONAL EXPOSITION, SAN FRANCISCO, CAL.

are in the city limits of San Francisco and face north on the shores of San Francisco harbor just inside its "Golden Gate" entrance to the Pacific Ocean.

On the left of the photograph in the background are the hills of San Francisco and nearer at hand the fence which incloses the exposition grounds on the south. In the center background are the hills of the United States Presidio military reservation, which extends into San Francisco Bay as far as Fort Point, which marks the south limit of the Golden Gate.

More than 80,000,000 ft. of lumber is being used on the main exhibit section of the exposition alone. Fourteen of the huge exhibit palaces are under construction, some of them rising as high as 160 ft. When completed the tallest structure will rise 430 ft.

Unification of Electric Supply in Paris

On Jan. 1 the Compagnie Parisienne de Distribution d'Électricité absorbed the six electric-supply companies previously operating in their respective districts in Paris. These companies—the Compagnie Électrique du Secteur de la Rive Gauche de Paris, the Compagnie Parisienne de l'Air Comprimé, the Société l'Éclairage Électrique du Secteur de la Place Clichy, the Compagnie l'Éclairage Électrique du Secteur des Champs-Elysées, the Compagnie Continentale Edison, and the Société d'Éclairage et de Force par l'Électricité à Paris—have hitherto held the right to supply electricity in Paris. The tenure of their concessions was eighteen years, the dates at which these began varying from 1889 to 1890. The terms of the concessions, however, did not give the city any mandatory powers in regard to the purchase of the power houses, though the mains laid revert to it. The desirability of consolidating the supply of Paris led to the Municipal Council taking up the question, and in 1906 definite proposals were put forward. Negotiations were entered into with a syndicate of the existing companies under the name of Unions des Secteurs, the companies being called "secteurs" because their areas approximated to "secteurs" of the whole of Paris taken as a circle. This union developed into the concern now styled the Compagnie Parisienne de Distribution d'Électricité.

The dates of the concessions were all adjusted so that they expire on the last day of 1907, and the date for the Compagnie Parisienne to begin operations was fixed at Jan. 1, 1914. During the interval of six years the entities of the companies practically disappeared and were replaced by the Comité de l'Union des Secteurs. This in turn is displaced by the Compagnie Parisienne d'Électricité, which will own the concession until June 14, 1940, a committee of control being appointed, as representing the municipal and public interests, to which certain points of executive detail are referable before the company can put them into operation.. This company since 1907 has been engaged in preparing the necessarily involved distributing scheme and erecting and equipping the two new generating stations which are to supply areas of the Secteurs.

The scheme has been carried out in such a way as to minimize the work on the actual distributing system and also to obviate opening up roads as far as possible. With this purpose in view the existing substations have been used and certain other substations built, so that the energy delivered from the two main generating stations will be transformed to the voltage required on the various local distributing networks. The latter remain largely as at present, but a certain amount of relaying is to be gradually carried out, the mains to be laid immediately being the high-tension mains connecting the new generating stations with the substations and coupling centers (about 280 miles) and the feeders connecting the substations with the consumers' distributing network.

The whole area of Paris will be divided up into three sections—western, central and eastern. The western will be supplied with single-phase current, the central with direct current, and the eastern with two-phase current.

The energy will be generated at 12,300 volts, two-phase, 41.6 cycles. In the western zone this will be delivered to four substations (Muette, Sèvres, Gobelins and Les Ternes), where the voltage will be reduced for the distribution network to 3000 volts and farther transformed down to 110 volts (single-phase) by transformers on consumers' premises. At the central zone the same high-tension current will be delivered to eleven substations (Bondy, Trudaine, Saint Roche, Mauconseil, Sévigné, Puteaux, Bergère, Pasquier, Temple, Voltaire and Saint Antoine), where it will be converted to direct current. In the thinly populated east-

ern zone there will be five coupling centers (Dondeauville, Laumière, Menilmontant, Charonne and Daumesnil), where the same high-tension supply will be divided up and delivered (two-phase) to a large number of transformer stations, where the voltage will be reduced to 110.

The rating of the North station at St. Ouen-les-Docks is 50,000 kw, and that of the South station at Issy-les-Moulineaux 25,000 kw. Each of the stations can be doubled in size if necessary. The output taken over by the new company is in the neighborhood of from 80,000,000 kw-hr. to 90,000,000 kw-hr. per annum.

In respect to lighting, the company will hold a monopoly, but not as regards the energy for motors. Further, the Paris municipality reserves the option of providing for future demands by taking a bulk supply if necessary from any hydroelectric plant; in fact, serious consideration has been given to the question of a hydroelectric station on the Rhone, which would also be able to provide for supply to the departments in the intermediate territory.

Electric-Vehicle Meeting at Salem, Mass.

A meeting of the New England Section of the Electric Vehicle Association of America was held at Salem, Mass., on Jan. 15, with Chairman J. A. Hunnewell presiding. To stimulate local interest in the possibilities of the electric truck and passenger car, a parade under the auspices of the Salem Electric Lighting Company was given in the afternoon over an 11-mile route through Salem, Peabody and Beverly. Fifteen different makes and styles of electric vehicles were in line.

START OF ELECTRIC-VEHICLE PARADE IN SALEM, MASS.

The principal speakers at the meeting were Mr. Day Baker, president of the Electric Motor Car Club, of Boston; Mr. H. F. Thomson, of the research division, department of electrical engineering, Massachusetts Institute of Technology, Boston; Mr. Frank J. Stone, New England manager of the Electric Storage Battery Company, Boston; Mr. George W. Holden, New England representative of the Edison Storage Battery Company, Boston, and Mr. Howard T. Sands, general manager of the Tenney companies, Boston. Sample storage cells were exhibited and lantern slides illustrating electric-vehicle and battery service were shown. Mr. Thomson pointed out the simplicity of the electric vehicle as compared with the gasoline machine, and stated that the general result of the researches conducted at the institute upon motor transportation indicates that for city service the electric vehicle is more economical than the horse or the gasoline-driven machine. A final bulletin upon motor-vehicle research will be issued in about a month.

The announcement was made that at the February meeting a paper upon "Traffic Conditions in Boston" will be presented by Mr. W. W. Scott, of Pawtucket, R. I., and that the March meeting will be devoted to the consideration of a new form of rectifying apparatus. Twelve new members have been added since Nov. 14. A spring meeting will be held at Hartford, Conn. The garage committee announced that six of the leading garages in Boston have agreed upon standard charging rates. The results of the electric-vehicle campaign in Massachusetts on Dec. 31 were as shown in the accompanying table:

ELECTRIC-VEHICLE REGISTRATION, MASSACHUSETTS

	Dec. 31, 1912	Dec. 31, 1913
Passenger cars	487	604
Commercial cars and trucks	262	409
Total	749	1013
Per cent gain during year	17	35

Illinois Electrical Contractors Meet

The midwinter convention of the Illinois Electrical Contractors' Association was held at the Hotel Leland, Springfield, Ill., Jan. 16 and 17. At the opening session Mr. G. A. Harter, of Chicago, voiced the sentiments of the manufacturers present in a statement to the effect that three schedules of prices should be maintained, namely, a jobber's price, a contractor's price and a consumer's price. This would protect the interests of the jobber and the contractor, so that both could do a profitable business. It was also brought out that contractors who cultivate the acquaintance of their customers after wiring jobs have been secured are often a factor in the sale of fixtures, motors and other electrical appliances. Others who discussed the three-price schedules were Messrs. G. H. Lounsbery, of Chicago; C. W. Beach, of Cleveland, and C. R. Hunt, of Chicago. Mr. V. A. Swett, of Chicago, said that it is desirable to do business with an established firm and he believed an agreement which excludes the dealer having no credit to be desirable.

The Society for Electrical Development and the National Electrical Contractors' Association, said Mr. Ernest Freeman, both stand for co-operation and both seek to better the business conditions for those in the industry. After outlining the plan, contemplated by the Society for Electrical Development, of sending men into the field to study conditions where the local central station and contractors are not co-operating, the speaker urged all reputable contractors to become members of the society.

Licensing of Contractors

At the morning session on Jan. 17 Dr. M. G. Lloyd, of Chicago, gave a short talk on a contractors' license law, stating that investigations of laws of other states should be made with the idea of eliminating all weak and objectionable features from the Illinois bill.

Mr. J. E. Latta, representing the Underwriters' Laboratories, stated that wiring rules are not made by an autocratic organization but that the ideas of all are solicited. He said that the laboratories were not run for profit, but most of the physical property was owned by the fire insurance companies, and the fees charged were based on the actual cost of making tests and paying men in the organization.

Speaking on the subject of state license, Mr. C. R. Kreider, of Chicago, said that few states at present have license laws and that municipal laws where they now exist are but a monetary proposition, the contractor paying a price for a certified tag. This condition, he said, is wrong in principle, for the workman as well as the contractor ought to be qualified. The law should require working electricians to pass an examination.

Discussion showed that several members favored an act establishing a master electrician's license, and Mr. Ernest Freeman moved that the association go on record as favoring an act regulating the installation of wiring and electrical appliances. The motion was carried.

Co-operation

Reading a paper on "Local Associations," Mr. W. J. Collins, of Chicago, said that if the contractors would drop their present mockery of independence and cooperate, increased profits, more satisfied customers and a better standing would be the result. Mr. A. M. Knauber, of Oak Park, spoke briefly in favor of local associations, stating that competition should be prevalent in the matter of quality but that there should be no competition in price.

Mr. J. C. Marron, Rock Island, said that as a rule the central stations are willing to co-operate with contractors in all undertakings but that it should be a task of the Society for Electrical Development to bring about a further mutuality of interest. The speaker suggested that each contractor report annually to the central station the amount of business which has been secured for the electric-service company through his solicitation or individual efforts. Such a report, said the speaker, will show the central-station man how valuable an ally the electrical contractor is.

Through the co-operative efforts of the contractors and the electric-service company in Chicago, Mr. W. J. Collins said, 110 old houses have been wired in the last three months. Contractors competing with a central station on an equality basis should have no fear, for the greater volume of business will come to them because of the natural prejudice of the public against the lighting company.

Mr. J. Hughes, of Champaign, Ill., related experiences showing that contractors should be careful in criticising the work or service of central stations, as these criticisms generally reach the electric-service company.

After a long discussion on rates and payments of liability insurance, a committee of five was appointed to investigate the advisability of forming a mutual company to carry the contractors' risk. It is estimated that about $40,000 can be saved annually if such a company is formed.

At a short afternoon session Mr. F. L. Decker, of Chicago, read a paper on "Business Education" in which he stated that the cost-keeping system adopted by the majority of contractors in the State had been quite successful.

As the result of discussion in closed session and the subsequent deliberation of a committee, the association decided to employ a representative to travel among the members and boost the association to the contractors in the State who are not members. His duties will correspond closely to those of the national traveling representative. Members of the association will be assessed pro rata on gross business to pay the expenses incurred by this "booster."

President W. J. Ball, of Moline, announced at the close of the meeting that the next convention of the society would be held in Danville, Ill., June 19 and 20, 1914.

Contractors, Dealers and Manufacturers Have a Heart-to-Heart Talk in Milwaukee

Lively and outspoken discussion marked the open session of the convention of the Electrical Contractors' Association of Wisconsin at Milwaukee on Jan. 13. Representatives of the contractors, supply dealers and manufacturers told one another their faults, in a business sense. There were some brisk exchanges, but the disputants felt better after freeing their minds, and the meeting ended in the most harmonious spirit.

Benefits of Association

Mr. Ernest Freeman, of Chicago, president of the National Electrical Contractors' Association, led off with a non-controversial speech setting forth why all contractors should join the association of which he is the head. In relation to interpretations of the National Electrical Code, he said that the association had made ten appeals and had been upheld in every one. Speaking of the association's bookkeeping system, he promised that the society, at its own expense, would send a man into any city to teach the system to some bookkeeper designated, if the local contractors expressed sufficient interest. Mr. Freeman advocated the establishment of a school to teach estimating on electrical construction work.

Mr. D. Elmer Roberts, of Racine, Wis., a contractor and retail dealer, said that the estimating sheet issued by the association had proved valuable. Another gentleman asked if the East did not dominate the national association, and Mr. Freeman said that there was nothing in that idea. Mr. Low added that while it was true that Eastern men—large contractors whose problems were not the same as those of the men in the Wisconsin association—dominated the association four or five years ago, that condition of affairs did not exist at present.

The Large Supply Dealer and the Contractor

Mr. W. W. Low, president of the Electrical Appliance Company, Chicago, read a paper on "The Relation of the Supply Dealer to the Contractor." He began by saying that there is no such person as an electrical jobber. Mr. Low said that he did not know anyone handling electrical material in wholesale quantities exclusively. He used the term "supply dealer." He told of one supply house where an examination of a month's business showed an average charge of $18. In Mr. Low's own business over 60 per cent of the orders received from contractors are for $10 or less. Most of these small orders are really handled at a loss. Mr. Low made an earnest plea to the contractors to be friendly with the large dealers. It is not practicable for the contractor to place his little orders with the manufacturer. Consider the delay and the cost of freight. "If the dealer is good enough to take care of your emergency orders," said the speaker, "you owe him your larger orders, so that he can make a reasonable profit." Mr. Low devoted considerable time to the so-called jobbers' sliding scale of small-quantity prices. These prices vary with the size of the order. They have been a good thing for the legitimate contractor and have protected him from the "curbstoner." The latter is being eliminated by the contractor who purchases his material in quantities. But the contractors have tried to break down the sliding scale. This course is unwise. The dealer has a place in the industry and the contractor should give his business to the dealer. Mr. Low also recommended the contractors to cultivate friendly relations with their competitors; confidence among competitors is a great asset.

Mr. Roberts, of Racine, took issue with Mr. Low.

The vital question to the small contractor, he said, is the unfriendly position of the jobber toward the contractor. Jobbers' salesmen call diligently on the "curbstoners" and on consumers and give them the same prices as they do to the contractor. This is not fair; it is not done in any other than the electrical business. Until the dealer protects the contractor things will go wrong. The jobber should stop retailing and peddling. He should act friendly as well as talk friendly.

Mr. Low said that Mr. Roberts was mistaken in his ideas. The contractor should buy in large quantities. The so-called jobber is not a wholesaler; he is just a large dealer. The sliding scale guarantees the contractor a profit. All dealers are not responsible for the small proportion who go through a city with a fine-tooth comb looking for orders. Mr. R. J. Nickles, of Madison, Wis., alluded to one large supply house as "pirates." A representative of the Central Electric Company, of Chicago, came to the defense of the supply dealers. Mr. Low arose again to say that the small contractor and dealer ought to improve his own selling organization. Mr. Benjamin Burdick, of Milwaukee, asked if the contractor could not be recognized by the large dealer and obtain a reduced price because he is engaged in the business. Apparently, large consumers get the same prices as the contractors. Mr. Low fully agreed that it would seem that in fairness every contractor and central station ought to get a reduced price from the large dealer. This was the case several years ago, but the government has stopped the practice.

Quality Versus Price

Mr. F. F. Skeel, Chicago, Crouse-Hinds Company, read a paper urging the contractors to insist on better goods and better prices. His subject was "The Relation of the Manufacturer to the Contractor." He said that the average consumer thinks of the manufacturer as a robber and the contractor as a middleman who is no better. The speaker viewed the middleman as affording the most economical means of distribution. He urged an advocacy of the policy of quality rather than the policy of price. Among manufacturers the commonly accepted idea is that it is no use to talk higher priced material—that is, quality—to an electrical contractor. That is the reason why in many cases the high-grade manufacturer feels that he must work against the contractor. Too often the contractor is willing to work under specifications which are a sort of a cross between a dog license and a chattel mortgage. Thousands of contractors, in defending themselves from one another, do not dare to buy good goods. The average electrical contractor has the reputation that he will accept anything that will "get by." No department of justice would have anything to say against competition based on quality. A price campaign will never build up a business. "Don't be afraid," said Mr. Skeel, "that you will take too much on a job. Your next job may take away half of the profit on the first one." The speaker quoted approvingly Ruskin's dictum that "those things called dear are, when justly estimated, the cheapest."

Mr. Burdick said he believed the blame to rest largely with the underwriters. They establish standards. If there is so much cheap and shoddy material on the market, it is high time that the protesting manufacturers took the matter up with the underwriters. The consumer says that what is good enough for the underwriters is good enough for him. Mr. Skeel met this by saying that the underwriters are in the position of defending life and property from material which is available. Things get through as "safe" that are not of the highest excellence. Standards are too low, and contractors are much to blame.

Mr. F. J. Natwick, contractor, Grand Rapids, Wis., was willing to admit some of the charges against the contractors, but jobbers sometimes take advantage of contractors. On big jobs consumers can buy material as cheaply as the contractors. The contractor cannot make a profit on labor alone and live. The contractor, acting perhaps as the agent of the jobber, should be protected by a margin of, say, 5 per cent when a big job comes along. The lamp situation is on a satisfactory basis now from the point of view of the contractor. Mr. Burdick asked if recognized channels for handling electrical products, as manufacturer to dealer to contractor to consumer, could not be arranged. In other industries this seems to be done.

The Engineer and the Contractor

Mr. F. A. Vaughn, consulting engineer, Milwaukee, prepared a paper on "The Relation of the Consulting Engineer to the Contractor," which was read by Mr. A. J. Sweet. Mr. Vaughn contended that the consulting engineer should stand for higher conditions by adhering to ethical standards. An important duty is laid on the engineer in preparing specifications of high quality. The contractor must do his part in equally high-grade construction. Architects should relegate engineering problems to engineers. They should be included in the co-operative scheme. Engineering specifications should be very clear and definite and sufficiently minute. The engineer should co-operate with the high-grade contractor and protect him from cut-throat competition.

Mr. Sweet added that if a perfectly definite plan is placed before the contractor it is hardly likely that he will take the business on a losing basis. It is where latitude is allowed that poor materials creep in. Thus the effort of the consulting engineer to establish quality is in the truest sense co-operation with the legitimate contractor. As to standards, it is to be remembered that the underwriters' requirements must be safe for all classes of installations, for factory as well as office building. The problem seems to be how to get consulting engineers on practically all of the business of the contractor. That seems very difficult, but why could not the contractors of a given community pass on quality themselves by fixing certain standards in concert?

The Contractor's Side of It

Mr. A. C. Langstadt, of Appleton, Wis., a contractor, considered the relations of manufacturers, dealers and contractors. He said that jobbers should not compete with contractors for retail business. If they do, they cannot blame the contractors for retaliating by buying of manufacturers. The contractor should be somebody in his own locality; he should keep up his credit and have an established place of business. Manufacturers and jobbers should draw their credit lines closer and should not extend credit to the fly-by-night so-called contractors. Prospective buyers not known should be investigated. The jobber should not secure two poor customers in place of one good one. The best of feeling exists between consulting engineer and contractor where both are competent. But engineers should not write one part of the specifications and expect the contractor to guess at the other nine parts. Mr. Langstadt indorsed the sliding scale of prices defended by Mr. Low. "If you will play square with the manufacturer and jobber, you will get value received every time," he said.

Mr. Low said that the majority of large dealers do not desire the business of "curbstoners." Inquiries from unknown persons are often referred to some responsible contractor or the central-station man. The supply dealer should go after the business of the contractor, the central station and large industrial establishments. Mr. Natwick asked where the line should

be drawn between the local contractor, usually also a small dealer, and the large dealer, in selling supplies to large industrial concerns. Mr. Low thought some basis could be agreed upon. Possibly the contractor should get the ordinary day-by-day business and the large dealer the business due to an extension of the works or some broad expansion of the electrical development of the house.

Mr. Roberts, the last contractor to speak, said that the history of the art shows that the manufacturer and jobber have not been fair to the contractor. Many honest contractors have been hammering on quality for years, but for some reason they don't seem to get along. The speaker drew a vivid word picture of the difficulties that beset the contractor. "Talk justice to us," he urged vehemently; "don't talk quality merely. Treat us fairly."

Mr. A. A. Gray, Chicago, *Electrical Review and Western Electrician*, made a strong plea for the Society for Electrical Development.

Mr. Martin J. Wolf, Chicago, Hotpoint Electric Heating Company, spoke briefly on co-operation. "We all want to co-operate when we want to buy something," he said, "but we are not so keen about it when we have something to sell. Let electrical men of all pursuits be frank with one another."

Several closed sessions were occupied with discussions of business policies. Eleven new members were elected. Officers were chosen as follows: President, Mr. W. R. Johnson, Wausau; vice-president, Mr. L. W. Burch, Madison; treasurer, Mr. George Knoerr, Milwaukee; secretary, Mr. Albert Petermann, Milwaukee; directors, Messrs. R. J. Nickles, Madison; George F. Rohn, Milwaukee, and A. C. Langstadt, Milwaukee. The summer meeting will be held in Detroit, Mich., in July during the annual convention of the National Electrical Contractors' Association.

Convention of the National Telephone Association

The seventeenth annual convention of the National Independent Telephone Association met at the Hotel La Salle, Chicago, Jan. 13-15. At the first session of the convention Mr. J. Adam Bede, St. Paul, delivered an interesting address on the solution of American problems.

At the Wednesday morning's meeting Mr. Richard Yates, former Governor of Illinois, now a member of the Illinois State Public Utilities Commission, addressed the convention on the functions of the commission as adjuster of affairs between the State's utilities and the people.

Mr. William Fortune, Indianapolis, Ind., spoke on needed amendments to the income tax law.

In his annual address President Manford Savage, of Champaign, Ill., called attention to the present growth of the doctrine of decentralization, as marked by the dissolution of interlocking directorates of the Morgan companies and the recent agreement of the American Telephone & Telegraph Company with the United States Department of Justice.

In declaring the principles for which the National Independent Telephone Association stands, the president said that the local or independent companies should at all times supply the local wants of the people, and that the long-distance service of the country should be supplied over lines owned by a nation-wide concern.

According to the convention programme, Thursday's session was to have been occupied largely with a "conference on toll connections between independent companies and the Bell Telephone Company, including explanation of the recent agreement between the Attorney-General and the American Telephone & Telegraph Company, by Mr. N. C. Kingsbury, vice-president of the American Telephone & Telegraph Company. Serious illness prevented Mr. Kingsbury's attendance, but in a short telegram he conveyed to the convention the fact that the details of the co-operative plan in acordance with the ideas of the now famous "Bell letter" were being worked out.

In its report the committee on resolutions embodied the ideas set forth by the president of the society in his address.

The annual banquet of the association on Jan. 14 was attended by approximately 350 members and guests.

Judge N. G. Hunter, Wabash, Ind., was elected president for the ensuing year. Election of other officers was deferred until a subsequent meeting of the board.

Wisconsin Electrical Association at Milwaukee

According to the estimate of Secretary Allison, about 250 persons attended the sixth annual convention of the Wisconsin Electrical Association in Milwaukee on Jan. 15 and 16. This number included a few ladies and a large number of supply men. The average character of the papers presented was exceptionally high. Mr. William H. Winslow, of Superior, Wis., vice-president of the Superior Water, Light & Power Company, the president of the association, presided. The delivery of his address was the first important feature of the proceedings.

President Winslow's Address

In a brief, well-reasoned address Mr. Winslow said that from the somewhat scanty figures available it is judged that the electric-service utilities of Wisconsin made a considerable gain in business, comparing the years ended June 30, 1912 and 1913. But the increase comes from a few of the larger plants, and it is apparent that there are a number of central-station companies in the State that are making little progress. The association should help to develop these latent possibilities. The electric-railway companies of the State show an apparent loss in both gross earnings and gross income. Cost of operation has gone up, but the nickel fare remains stationary. "With none of the manifold ways of increasing business open to the light and power companies," said Mr. Winslow, "it would seem that the street-railway companies have a very difficult problem." Perhaps fares should be readjusted on a basis of length of haul. Legislative matters received much attention from the officers of the association last year. Possibly consolidation with the Wisconsin Gas Association should be considered, to the end that there shall be one strong utility association in the State. As to the effect of the original public utility regulation and stock and bond laws of the State, the president said that he believed the result had been, on the whole, beneficial to established utilities. But financing of new enterprises has been made difficult or impossible. It is possible that the issue of stock bonuses cannot be revived. Mr. Winslow expressed his approval of an amendment to the stock and bond law permitting the issuance of stock without par value, or profit-sharing certificates, as they are sometimes named. Such issues would facilitate the financing of new enterprises and the consolidation of small and inefficient plants. The study of the subject of supplying electricity to farms and rural districts was recommended.

This address was referred to a committee consisting of Messrs. Wheeler of Eau Claire, Lord of Waupaca

and Gonzenbach of Sheboygan, all past-presidents. Later this committee made a report commending the address and requesting the new administration to appoint a committee on co-operation with other associations and another on rural extensions.

Mr. George Allison, of Milwaukee, secretary and treasurer, presented a report showing the finances of the association to be in good condition.

Accounting for Small Central Stations

Mr. H. G. D. Nutting, Milwaukee, gave an illustrated paper on "A Practical Accounting System for Small Central Stations." A complete system was recommended suitable for Class B and Class C companies as classified by the Railroad Commission of Wisconsin. Mr. Nutting's system is based on the commission's requirements. A number of forms devised for this system were shown on the screen.

There was some discussion. Mr. Nutting explained the difference between earnings and cash received. Cash collections are not necessarily earnings. The examiner of accounts of the Railroad Commission, who was present, said that accounting forms had been devised by the commission and that the commission's system differed materially from that of Mr. Nutting. It is not compulsory, however, to use the form of the commission. Mr. Nutting said that the small company should look on both systems as merely tentative. The commission and the state association should get together and agree upon a practical system. By vote the association established an accounting committee.

New Laws Affecting Wisconsin Utilities

Mr. John B. Sanborn, a lawyer of Madison, who has represented the association before the Legislature, read a short paper reviewing the laws relating to public utilities passed by the Wisconsin Legislature last year. There have been some changes in the workman's compensation act by which the defense of contributory negligence is wiped out where the employer has four or more employees. Every employer must now take out indemnity insurance or convince the state industrial commission that he does not need it. The stock and bond law has been amended to permit an increase of stock up to the actual value of the property. Municipalities may now acquire public utilities lying wholly or in part outside of the boundaries of the municipality. Electric-light companies have now the right to condemn property if the courts decide that the property is necessary and proper for the use of the company. City councils are compelled to put in special ornamental lighting if the residents of a street petition for it. The 1913 water-power act has yet to stand the test of the courts. All future development of water-powers in the State to the extent of 250 hp or more, where the power is to be sold to the public, must be made under franchises granted only to corporations organized under the new law or to municipalities or to existing utilities. The Railroad Commission of Wisconsin must approve the applications. Various restrictions are provided. Mr. Sanborn gave it as his opinion that the prospects for new water-power development in Wisconsin are not bright under the new law.

Liability Insurance

Mr. Ernest Gonzenbach, of Sheboygan, presented a brief informal report on liability insurance. There has been no particular change in the attitude of the committee since the report of a year ago. The committee tried to work out a co-operative insurance plan for the member companies of the association, but nothing tangible has resulted.

Methods of Making Line Extensions

President Winslow spoke of the diversity existing in the methods of electric-service companies in making line extensions for customers. At his request Mr. Nutting, of Milwaukee, explained a system that he has worked out. Companies usually require that the estimated gross revenue from the extension in a year shall be at least as much as the cost of the extension. Sometimes the revenue for two or three years is accepted, and in some cases no rule is followed. Sometimes the prospective customer contributes part of the cost of the extension. Under these circumstances Mr. Nutting has tried to work out a method to be followed on some rational basis. He made an analysis of the cost of taking on new customers and worked out a formula for general use based on the various costs entering into the extension. The formula provides for the interest on the new investment, depreciation, taxes, operation and maintenance, as well as overhead charges. It was decided to appoint a committee to consider uniformity in making extensions.

Co-operation with Contractors

Mr. F. J. Natwick, Grand Rapids, Wis., an electrical contractor, addressed the convention twice, urging the central-station men to adopt some form of direct and systematic co-operation with the contractors of the State. He invited the central-station men to attend a conference to be held in Milwaukee next April by the Electrical Contractors' Association of Wisconsin. A motion was passed directing that a committee be appointed to attend this April meeting.

Street-Railway Papers

Mr. E. W. Hammett, of Sheboygan, presented the report of the committee on train dispatching. Mr. C. M. Larson, chief engineer of the Railroad Commission of Wisconsin, read a paper on "Street Railway Traffic Surveys in Relation to Railway Operation." Mr. E. Taylor, General Electric Company, and Mr. Clarence Renshaw, Westinghouse Electric & Manufacturing Company, read papers on maintenance of car equipment. Mr. Larson's able paper caused an interesting discussion. Mr. R. B. Stearns, vice-president of the Milwaukee Electric Railway & Light Company, said that he regarded the work of the Railroad Commission of Wisconsin as most important. He described the new zone system to be put into effect in and near Milwaukee for charging street-railway passengers according to the distance carried. Mr. Larson made the statement that electric-service utilities are adapting themselves to present-day conditions more rapidly than the street railway utilities.

Electric-Service Rules in Wisconsin

Mr. F. A. Vaughan, of Milwaukee, made a valuable report as chairman of the committee on electric-service rules revision. The new rules for electric service of the Railroad Commission of Wisconsin were put into effect on Oct. 9, 1913. The commission has worked in harmony with the state association and has also held public hearings on the subject. The rules adopted are being copied by other states. In relation to maximum-demand meters, the commission, at the instance of the electrical men, did not insert the tentative Rule No. 28, which would have required the testing of maximum-demand instruments in as careful a manner as required for watt-hour meters. The committee saw that this was impracticable at the present time, and on promising to make strenuous attempts to standardize the practice and develop proper maximum-demand meters through the manufacturers, the commission agreed, for the time being, to strike out Rule No. 28 and with-

hold any further rulings on maximum-demand indicators for one year.

Discussion

Mr. John N. Cadby, service engineer of the commission, complimented the association on the work of its committee. He said that the rules for electric service are not perfect yet, but they are fairly satisfactory for a start. Unquestionably it was wise to hold up for a time action on maximum-demand-indicating devices.

Mr. F. A. Kartak, of the University of Wisconsin, described the work of the Standards Laboratory, operated by the electrical engineering department of the university in conjunction with the Railroad Commission of Wisconsin. He described the testing of portable standard watt-hour meters and said that the laboratory is working out a standard shipping box to be used for shipping meters to and from the laboratory.

The very efficient committee on electric-service rules revision was continued. Mr. Vaughan is chairman of the committee, and Mr. S. B. Way, vice-president of the Milwaukee Electric Railway & Light Company, and Mr. George Allison are the other members.

Co-operative Advertising and Publicity

Mr. George B. Wheeler, of Eau Claire, made a brief report for the committee on publicity. He said that since the committee was formed two years ago, the need for co-operative effort by the members of the association has been largely eliminated by the number of private concerns now engaged in preparing advertising matter and conducting publicity campaigns for central-station companies. The committee asked the secretary of the association to prepare a list of all the private concerns engaged in preparing and selling publicity matter, this list to be sent to all the members of the Wisconsin Electrical Association. The committee advocated daily newspaper advertising and spoke of the necessity of the utility furnishing the public information as to its plans and methods. It should take the public into its confidence. Utilities have nothing to conceal in their business relations with customers.

Inspection of Overhead Construction

Mr. S. B. Way, of Milwaukee, presented the report of the committee on overhead inspection. The necessity of employing good design, material and workmanship in overhead construction was emphasized. In a measure all employees should be trained to report defects, but in addition to this general alertness overhead lines should be inspected at regular intervals. The length of these intervals depends on the character of the overhead lines. The committee recommended that overhead lines carrying 7500 volts or more be inspected every three months; lines carrying from 1000 volts to 7500 volts should be inspected every six months, and lines carrying less than 1000 volts should be inspected once a year. Blanks should be provided for the use of inspectors.

Discussion

Messrs. W. E. Haseltine, of Ripon; Vaughan, of Milwaukee; P. H. Korst, of Janesville; Winslow, of Superior, and others took part in the discussion. The point was brought out that the companies should not only inspect their lines at regular intervals, but should stand ready to prove in a court of law at any time that the lines have been inspected. This will show, in case of accident,, that the company was not negligent. The industrial commission of the State of Wisconsin is now at work on standards for electrical work, but the rules as proposed do not contemplate inspection. The association, therefore, should develop its own rules for overhead inspection and submit them to the commission for adoption. The report of the committee was accepted and the committee was continued.

Voltage Regulation

Mr. G. G. Post, electrical engineer of the Milwaukee Electric Railway & Light Company, gave an illustrated paper on voltage regulation. He reviewed present-day practice, and among other things described the booster system for regulation in use in the downtown direct-current district of Milwaukee. In relation to alternating-current regulation, a scheme of connection for series transformer and line-drop compensator in the neutral of a three-phase unbalanced feeder was illustrated. Typical charts taken from graphic recording instruments were shown.

Discussion

In the discussion one operator of a Class B plant said that it is hard in the smaller towns to maintain the voltage within the 3 per cent variation required by the state commission. Mr. C. R. Phenicie, of Green Bay, wanted to know if automatic voltage regulators will not be required eventually on many of the lighting feeders, even in small-town plants. Mr. Vaughan said that engineers should be firm in specifying apparatus to insure good regulation. Mr. V. A. Hain, of the General Electric Company, spoke of the desirability of making a careful voltage survey. He discoursed briefly on the subject of voltage regulation, and asked the central-station men to remember that every minute the voltage is low every meter is running slow.

European Practice in Relation to Small Customers

Mr. S. E. Doane, of Cleveland, chief engineer of the National Lamp Works of the General Electric Company, gave an extremely interesting talk on his investigations of the relations of European central stations to their small customers. Mr. Doane found that in many respects the central-station men of European countries are far in advance of those in this country. This is particularly the case in relation to securing the business of small lighting customers. In Milan, for instance, a city about the size of Cleveland, the central stations have more than 90,000 customers, while in Cleveland the corresponding number is 40,000. In Milan there are 25,000 customers with an average connected load of less than 22 watts and with an average number of lamps installed of 1.8. Limiting devices are used in most cities for the very small consumers, but not in all cities. The limiting device used costs about $1.50. Mr. Doane mentioned the psychology of advertising so as to reach small customers. The better-off people will take electric light if the poor people can afford it, but the rule does not work the other way. Therefore small customers have a value from this point of view. Some of the billing methods used are new to this country. Nearly everywhere there are harmonious relations with the contractors. The latter act practically as the agents for the central stations. European electric-light men are familiar with practice in this country, much more so than American electrical men are with theirs. The Europeans read the American electrical papers and so keep in touch with the developments here.

Discussion

Mr. Doane's talk on foreign practice aroused much interest, and questions were asked by Mr. Vaughan, Mr. C. M. Axford and Mr. C. R. Phenicie, of Green Bay; Mr. Way and others. Answering these, Mr. Doane that he had brought back with him from Europe about thirteen types of limiting devices. These pieces of apparatus are light in weight, operated on the sole-

noid principle, and are inexpensive but effective. They will no doubt come into greater use in this country. The expense for wiring houses is often spread over a long term. Practically all city governments have functions of regulation. Municipal ownership is not a shining success, although it is true that men of high character usually direct the municipal undertakings in Europe. It is quite the ordinary thing for the company to accept the contractor as a solicitor. The central station carries the account for the wiring. In answer to Mr. Way, Mr. Doane said that the plan of serving the extremely small customers in European cities was not adapted to anything but lighting. Flatirons, for instance, could not be used on the circuits. However, lighting is a great advertisement for the use of electricity and helps to bring about a larger use on metered circuits.

High-Efficiency Lamps

Mr. Doane devoted part of his talk to the new high-efficiency tungsten nitrogen-filled lamps. He said that the remarkable and outstanding fact about these lamps is that incandescent lamps are now made without a vacuum. He exhibited a lamp in service taking 750

PRESIDENT-ELECT P. H. KORST

watts and giving approximately 1000 cp measured spherically. Mr. Doane said that he believed that, rating for rating, the new incandescent lamps are as efficient as flame-arc lamps. Greater improvements may be looked for in incandescent lamps, perhaps, as the latest types are only 12 per cent efficient. The trend of the times is distinctly away from free lamp renewals. Under the new conditions the consumer should pay for his own lamps.

Depreciation and Rate-Making

A paper entitled "Some Facts Relating to Depreciation and Rate-Making," prepared by Mr. Halford Erickson, member of the Railroad Commission of Wisconsin, was read by Mr. F. W. Doolittle, of the commission, in the absence of Mr. Erickson, who was detained at his home by illness. Mr. Erickson considered depreciation under four heads—wear and tear, general decay, obsolescence and inadequacy. In the second part of his paper, devoted to rate-making, Mr. Erickson expounded the well-known theory of the Wisconsin commission that rates should be based on the cost of service. Ordinarily, he said, no part of the service should have rates so low as not to cover operating expenses and at least some part of the general expenses. There is a considerable demand on the part of the public for a uniform meter rate, but it is logical that various classes of customers should be charged in proportion to their demand, the expense of serving them and general output expenses. The author said that the demand method of charging seems to be reasonable and just, and he believed that a uniform meter rate would be unjustly discriminatory. It would prevent the central station from taking a large amount of industrial business now available. It would, in fact, tend to reduce profits and to increase rates. Mr. Erickson does not think that advantageous rates would be obtained by enforcing a uniform meter rate of charge. The paper was a scholarly production and made a deep impression. There was some discussion, and the belief was expressed that few utilities in Wisconsin have actually set aside depreciation funds. Depreciation reserve has been usually invested in plant.

Mr. A. A. Gray, of Chicago, made a plea for the Society for Electrical Development, in the absence of Mr. J. M. Wakeman.

Election of Officers

On the recommendation of a nominating committee, of which Mr. O. C. Irwin, of Berlin, was chairman, officers for 1914 were elected as follows: President, Mr. P. H. Korst, Janesville; first vice-president, Mr. M. C. Ewing, Wausau; second vice-president, Mr. W. E. Haseltine, Ripon; third vice-president, Mr. B. F. Lyons, Beloit; secretary-treasurer, Mr. George Allison, Milwaukee.

Mr. Philip H. Korst, the new president, is secretary and manager of the Janesville Electric Company, and also is secretary and manager of the Edgerton Electric Light Company. The Janesville company operates both steam and water-power generating plants and supplies electrical energy to Newville, Fulton and Indian Ford, in addition to the cities named. Mr. Korst is one of the progressive central-station managers of his State. He was a charter member of the old Northwestern Electrical Association, and also of its successor, the present Wisconsin Electrical Association. In 1908 he was elected president of the Northwestern Electrical Association, and he has now been promoted from the vice-presidency of the Wisconsin association. He was born in Chillicothe, Ohio, fifty years ago, and has been engaged in electrical pursuits for over thirty years. For fourteen years he has been manager at Janesville, and for eleven years before that he was manager of the property at Racine.

Social Features

A theater party followed by a supper was given on the night of Jan. 15. Mr. Ernest Gonzenbach, of Sheboygan, acted as toastmaster, and informal speeches were made by Messrs. C. E. Searles, of Milwaukee; C. M. Axford, of Green Bay; Sam A. Hobson, of Chicago; P. T. Bowler, of Milwaukee; George Allison, of Milwaukee; L. E. Gould, of New York, and George B. Wheeler, of Eau Claire.

A rejuvenation of the Jovian Order was held on the night of Jan. 16. Twenty-four candidates were initiated. At the dinner Mr. P. T. Bowler, Jovian statesman, presided, and there were speeches by Messrs. T. M. Kiewert, Sam A. Hobson, H. E. Niesz, A. A. Gray, C. E. Searles, Ernest Gonzenbach, Charles Dean, George Allison and George C. Richards. Messrs. J. C. Stadelbauer and W. H. Patton gave an amusing burlesque sleight-of-hand performance.

Railroad Commission's Exhibit

Following the plan of last year, the Railroad Commission of Wisconsin made an exhibit at the convention. The exhibit of a year ago related principally to meter testing, street lighting and voltage regulation.

This year the exhibit covered entirely different features, there being no repetitions. The commission's new rules of service were displayed about the room. A rather elaborate exhibit showed the stream-gaging work which was recently begun by the Wisconsin commission in conjunction with the United States Geological Survey in administering the water-power law passed by the last Wisconsin Legislature.

The commission has issued forms for accounting, billing and the keeping of various records in compliance with numerous requests for suggested forms which have been made from time to time. Photographs and blueprints showing the accuracy of precision instruments and timing devices employed at the laboratory jointly maintained by the commission and the university were descriptive of the testing laboratory's work. Many recent publications of the commission and recent laws administered by it were on hand for distribution.

Public Service Commission News

Wisconsin Commission

The commission has made a valuation of the Manitowoc Electric Light Company's plant and has fixed upon $137,500 as the price to be paid for the property by the city of Manitowoc. The city is to take over the property under the indeterminate permit law.

The Endeavor Electric Light & Power Company has been authorized to increase its rates for electric lighting from 10 cents to 15 cents per kw-hr.

The Madison Gas & Electric Company has been ordered to restore service to a consumer to whom such service had been refused on the ground that bills contracted at previous places of residence had not been paid. It was decided that service cannot be withheld from one who is willing to comply with the rules and regulations requiring the furnishing of security for the payment of current bills when due, although he may be owing the company for past service at the time. The commission remarked that this rule may seem to work a hardship at times but that it should have the effect of greater scrutiny of credits on the part of the company in the future and a more extensive application of the rule relating to deposits.

New York Commission.

Pending a physical valuation of the property of the New York Telephone Company, an offer has been made by the company to the New York Public Service Commission, Second District, to reduce rates 10 per cent on all contract charges. The reduction will apply to all private branch exchange contracts and to all the various residence and business contracts, including extension telephones taking measured service, charitable rates and municipal discount rates. It will not apply to flat rates or to toll rates of any description or to rates of any kind which may be payable under old contracts for less than the present published standard tariff charges.

Indiana Commission

With the conclusion of evidence and the argument in the Indianapolis street-railway strike case before the Indiana Public Service Commission the members of the commission now have to prepare a decision. Afterward they will turn their attention to more than 300 cases which have been brought up from various cities and towns.

Evansville, Union City, Greencastle, Terre Haute, Lafayette, South Bend, Gary, Richmond and many other places have issues involving electrical properties. The rate cases in Indianapolis are still pending.

Current News Notes

LARGE CONNECTICUT RIVER DEVELOPMENT FORESHADOWED.—Our attention has been called to an error that occurred in the article under the above heading which appeared in the Dec 20 issue. The Northern Connecticut Securities Company, so we are informed, has absolutely no control or interest in the United Electric Light & Water Company, nor does it control any electric lighting properties in Windham and Tolland Counties.

* * *

SOUTH HADLEY ADOPTS MUNICIPAL LIGHTING.—At a special meeting held in South Hadley, Mass., on Jan. 12 it was decided by a vote of 169 to 44 to adopt municipal lighting. The town does not propose to manufacture electricity, but will buy it and distribute it, having already received offers for the supply of energy in bulk to the amount now used at 1.75 cents per kw-hr. The Amherst Power Company, which controls the South Hadley Falls Electric Light Company, received sixty days in which to file a bill of sale which the town can accept, but if the price is exorbitant the town will appeal to the courts to set the price.

* * *

LONG SAULT DEVELOPMENT SUIT.—The validity of the act by which the New York State Legislature of 1907 gave the Long Sault Development Company water rights on the American side of the St. Lawrence River amounting to about one-third of all the developed water-power in the United States was attacked in the Court of Appeals at Albany, N. Y., by State Attorney-General Carmody on Jan. 6. During 1912 the State Treasurer refused to accept the annual payment of $25,000 from the power company. The company brought suit to compel acceptance, and while the case was in the Appellate Division the Legislature repealed the act granting the charter.

* * *

HYDROELECTRIC BY-LAW DEFEATED IN SANDWICH, ONT.—By-laws authorizing the purchase of electrical energy from the Hydro-Electric Power Commission of Ontario were laid before the electorate in eight municipalities in the Province of Ontario on Jan. 5, and were carried in Richmond Hill, Oshawa, Strathroy, Wallaceburg, Hanover, Elora and Kemptville. Sandwich, however, would have none of it. The electors decided against the purchase of electricity from the Hydro-Electric Power Commission of Ontario and also voted down the expenditure of $8,430 for the construction of a distribution system. Sandwich receives its energy from the Sandwich, Windsor & Amherstburg Railway and is near the Michigan border line. When energy is delivered to the seven municipalities above noted the Hydro-Electric Power Commission will have 101 cities, towns and villages on its circuits.

* * *

SUGGESTED ORDINANCES FOR SMALL MUNICIPALITIES.—The National Board of Fire Underwriters of New York and the National Fire Protection Association of Boston, Mass., have devised for adoption by towns and small cities suggested ordinances characterized by brevity, simplicity and the avoidance of conflict with one another. These ordinances provide for fire limits and the construction and equipment of buildings in small towns and villages, for the regulation of automobile garages, for the regulation of the equipment and operation of picture machines and premises wherein the same are used, for the inspection of premises by

the fire department to safeguard the public and property against fire, for the cleanliness of streets, alleys and premises, for the burning of refuse, for the storage of explosives, for regulating the discharge or firing of fireworks and other pyrotechnic displays, and for fire escapes. The Underwriters would like to see the code enacted in its entirety, previous legislation, if any, being annulled by its adoption. Such slight changes as are necessary can be made by municipal attorneys without disturbing the main paragraphs.

* * *

MINNEAPOLIS STREET-LIGHTING CONTRACT.—By a contract with the city which went into effect on Jan. 1 the Minneapolis General Electric Company will operate 2800 6.6-amp magnetite-arc lamps for street lighting instead of 2400 as in 1913. The rate was decreased from $62.50 to $60 a year. The new lamps will be used for extensions and for replacing about 100 gas lamps. In addition the company operates 935 ornamental posts for curb lighting. These posts support five 60-watt tungsten lamps. The top lamp burns all night and the others until midnight.

* * *

A TEST OF UNDERGROUND CONSTRUCTION.—At the time of the recent subsidence of the surface of Randolph Street between State Street and Wabash Avenue, Chicago, when the street level sank about 8 ft., water pipes burst and other underground utilities were badly damaged. The Edison cables alone were self-supporting and remained suspended in mid-air in the conduit line containing them, with almost no damage. This was a severe test of the mechanical strength of the underground conduit construction of the Commonwealth Edison Company, and the manner in which it was met indicates the workmanship put into this type of construction.

* * *

LOCAL PUBLIC UTILITIES DEPARTMENT PLANNED FOR CHICAGO.—On the suggestion of Alderman Merriam it has been decided to eliminate all commission features from the proposed municipal public service department of Chicago. As originally planned there was to be a board consisting of the city electrician, city comptroller and a commissioner of public utilities to be appointed. It is now proposed that there shall be created a new department of the city government, to be known as the Department of Public Service, in charge of one official to be called the commissioner of public service. The proposed department would include bureaus of local transportation, gas inspection, telephone supervision and electric-service supervision. It would handle complaints. It is proposed that the heads of these bureaus shall be selected by civil-service methods.

* * *

YOUNG TECHNICAL MEN AFFILIATE WITH TRADES UNION MOVEMENT.—The Chicago Technical League, of Chicago and vicinity, is an organization that may either prove to be the nucleus of a movement of some importance or fail to attract widespread support as the future may determine. It consists of about 125 young men connected with the civil-engineering profession. About 90 per cent of these are college-trained men. One striking feature of this organization of trained technical men is that it is affiliated with the American Federation of Labor. The ultimate object is to endeavor to raise the salaries or wages of the younger men connected with civil-engineering offices and to standardize positions and wages. The constitution and by-laws of this interesting society are not as yet in print. The office of the Chicago Technical League is at 32 North Fifth Avenue, Chicago.

SOCIETY MEETINGS

CHICAGO JOINT MEETING.—At a joint meeting of the Electrical Section of the Western Society of Engineers and the Chicago Section of the American Institute of Electrical Engineers, to be held in the Western Society rooms, Chicago, on Jan. 26, Mr. Bion J. Arnold will present an illustrated paper on "City Transportation, Subways and Railroad Terminals."

* * *

BOSTON EDISON COMPANY SECTION.—At the first meeting of the Boston Edison Company Section of the N. E. L. A. for the year, scheduled for Jan. 20, the program included a visit to the principal exchanges of the New England Telephone & Telegraph Company in the Boston business center and a talk upon "The Operation and History of the Telephone," by Mr. Frank H. Clark, of the traffic department of the New England company.

* * *

JOVIAN ELECTRICAL LEAGUE OF SOUTHERN CALIFORNIA.—The regular weekly meeting of the Jovian Electrical League of Southern California was held Jan. 14 at Christopher's, Los Angeles, Cal. Mr. Martin Betkouski, one of the city fathers, delivered an address on "A Councilman—His Relations to the Public," and Prof. Edward B. Warman, lecturer and writer, gave a short talk, his subject being "Human Electricity." Entertainment was furnished by a local theater. A permanent degree team has been appointed and will make its first appearance at the next rejuvenation, which will be held Feb. 6.

* * *

WISCONSIN ELECTRICAL EXHIBITORS AT MILWAUKEE.—At the Milwaukee convention of Jan. 16 the Wisconsin Electrical Exhibitors' Association elected officers as follows: President, J. C. Schmidtbauer, Milwaukee, Julius Andrae & Sons Company; vice-president, W. H. Tompkins, Milwaukee, Western Electric Company; secretary-treasurer, H. F. Boggis, Milwaukee, C. J. Litscher Electric Company. Exhibitors at the Milwaukee convention of the Wisconsin Electrical Association were: Allis-Chalmers Manufacturing Company, Julius Andrae & Sons Company, Central Electric Company, Duncan Electric Manufacturing Company, Electric Appliance Company, Federal Sign System (Electric), General Electric Company, Harter Manufacturing Company, Illinois Electric Company, C. J. Litscher Electric Company, Moloney Electric Company, National X-Ray Reflector Company, Charles Polascheck & Brothers Company, Western Electric Company.

* * *

MEMBERSHIP LIST OF SOCIETY FOR ELECTRICAL DEVELOPMENT.—The Society for Electrical Development, Inc., has issued a list of its members bearing date of Jan. 15. This list contains 1195 names classified as follows: Manufacturers, 167; central stations, 251; jobbers, 239; electrical contractors, 522; miscellaneous, 16. The membership list of the society dated Nov. 15, 1913, contains 951 names, showing that during the fifty business days intervening there has been an increase of 244 members. Among those who have recently joined the society are the Toronto Hydro-Electric System, Toronto, Ont.; R. Thomas & Sons Company, East Liverpool, Ohio; Varney Electrical Supply Company, Indianapolis, Ind.; F. D. Lawrence Electric Company, Cincinnati, Ohio; American Platinum Works, Newark, N. J.; George Cutter Company, South Bend, Ind., and the MacAllen Company, Boston, Mass. The board of directors will hold a meeting in the Engineering Societies Building, New York City, Jan. 26.

Interconnected Electric Service at Warren, Ohio

Steam, hydraulic and gas-engine-driven stations of the Trumbull Public Service Company connected by transmission lines—Street lighting, commercial methods and growth

PRIOR to June 1, 1911, the city of Warren, Ohio, had two electric-service companies known as the Warren Water & Light Company and the Hydroelectric & Gas Company. The first-named corporation furnished electric service within the city limits of Warren only, while the "Hydro" company included in its field of operation, besides Warren, the neighboring towns of Niles, Leavittsburg and Newton Falls.

On the date above mentioned the two companies were consolidated under the name of the Trumbull Public Service Company and their operation was taken over by the Doherty Operating Company, 60 Wall Street, New York. The Trumbull Public Service Company is controlled by the Northern Ohio Gas & Electric Company, which is in turn associated with the Consolidated Cities Light, Power & Traction Company.

Since the consolidation the company has more than doubled its output of electricity. Extensions have been made in the territories formerly served by the old companies, so that the Trumbull company now serves in all eight cities and villages—Warren, Niles, Newton Falls, Leavittsburg, Phalanx, Windham, Garrettsville and Hiram. At Garrettsville and Windham small generating stations have been replaced by three-phase transformer installations supplied with energy over high-tension transmission lines. A new substation has been built near Mahoning from which the village of Windham and the Portage Silica Sand Company receive service.

The old Hydroelectric company had approximately 2100 hp in connected load. In two years the merger company has more than doubled that amount, and at present it has a total connected motor rating of over 5000 hp, including installations in sand plants, sawmills, lumber yards, feed mills, farms, paint mills, lamp works, machine shops, stove works, laundries and electrical manufacturing companies. The sand mills were taken on during 1913, and each has a load of 250 hp.

The most recent addition to the company's lines is the village of Garrettsville. This town has about 1000 inhabitants and about 330 residences. From a canvass of the community, just finished, it was found that of these 330 houses 200 are wired and their occupants are using electricity. During the week spent in Garrettsville by representatives of the company's commercial department orders were taken for wiring fifty houses and about sixty electric irons were sold.

A rather unusual condition exists at Warren in that the "peak" comes on during the day, as shown in Fig. 6. This is caused by the large motor load already referred to. The management is therefore making a determined effort to "even things up" by installing electric signs and securing new residence lighting. So far these efforts have been very successful. In the last twelve months the company has sold and erected about fifty-five signs, and it is adding from two to four new residence consumers daily. In the meantime, however, the motor load keeps "piling up" so that it looks as though the central station might have a day peak for some time to come.

Steam Generating Station

Five power stations house the generating equipment of the Trumbull Public Service Company, the principal station, a combination steam and hydraulic plant, being situated on the Mahoning River in the outskirts of Warren. This plant, together with the pumping station, also a property of the company, is shown in Fig. 1. An 1800-kw General Electric steam turbine exhausting into a Westinghouse condenser is the largest generating unit of the company. This machine is shown in the background of Fig. 2. A second and smaller turbine drives a 500-kw General Electric generator with a Fort Wayne condenser.

In striking contrast to these compact units, a 600-hp Cooper Corliss engine, operated condensing, drives a 400-kw, 2300-volt, 60-cycle alternating-current General

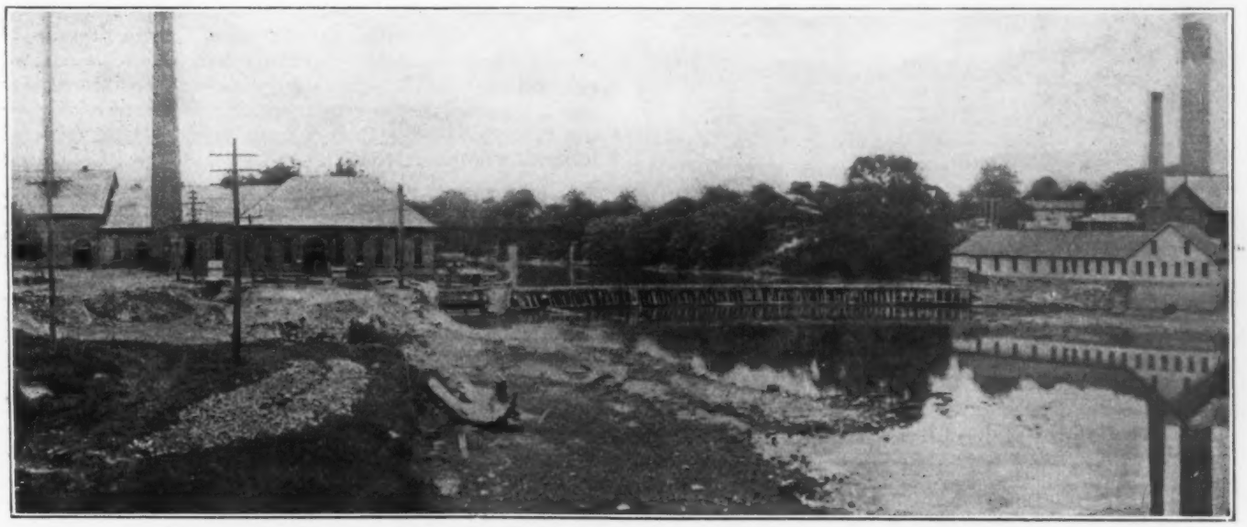


FIG. 1—MAIN GENERATING STATION, DAM AND PUMPING PLANT ON THE MAHONING RIVER, WARREN, OHIO

Electric generator and a 200-kw, 575-volt direct-current General Electric generator. Belted to the same shaft in the east wing of the station are one 200-kw, 2300-volt, 60-cycle General Electric alternator, one 150-kw, 550-volt Westinghouse Electric & Manufacturing Company direct-current generator, and one single-action

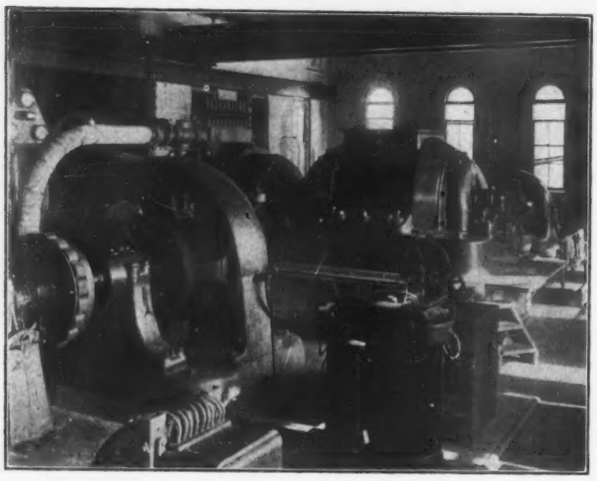


FIG. 2—1800-KW TURBINE WITH 200-KW DIRECT-CURRENT GENERATOR IN FOREGROUND

Hamilton pump with capacity of 1,500,000 gal. of water every twenty-four hours. This apparatus is driven by a 450-hp Hamilton Corliss engine operating with a Dunn-Gordon condenser.

When the flow of the river is moderate, a 61-in. Trump vertical waterwheel operating on a 6-ft. head may be directly connected to the water pump and belted to the line shaft to relieve the Corliss engine. The dam which furnishes the head for this wheel is shown in Fig. 1. The exciter equipment of the station is separated into two units, one a 35-kw turbo-generator and the other a 30-kw motor-generator set, both manufactured by the General Electric Company. The engine room is served by a 12-ton crane built by the Euclid (Ohio) Crane & Hoist Company.

Up to the present 2100 hp in boiler rating has been installed in the station. This hand-fired steam-gen-

FIG. 3—WEST FORK PLANT, NEWTON FALLS

erating equipment is divided among a 500-hp Erie City boiler, a 400-hp Stirling boiler and two 600-hp Stirling boilers. Two steel stacks 135 ft. and 180 ft. high respectively and a 134-ft. brick stack provide draft for these boilers.

Water for the entire battery of boilers is furnished by a National coil-type closed feed-water heater. Two feed pumps, one an 8-in. by 5-in. by 10-in. single-action steam-driven pump and the other is a 7.5-in. by 5-in. by 10-in. duplex pump, deliver water from the river to the feed-water heater. Both pumps are products of the Union Steam Company, Battle Creek, Mich.

During the floods of March, 1913, the rapid rise of the river gave considerable trouble. Recurrence of this, however, has been anticipated by building a high concrete retaining wall along the river on the upstream side of the station.

The main switchboard of the steam plant consists of fourteen panels. Beginning in the foreground, the first two panels control the feeders of several large factories in the vicinity, among which are a motor-driven brickyard, the Peerless Electric Company, Trumbull Mazda Lamp Company and the McMyler foundry. The third panel carries a Tirrill regulator. Direct current for the downtown district and for four motor-driven pumps which have never been changed over from an old system is furnished from the fourth and fifth panels of this

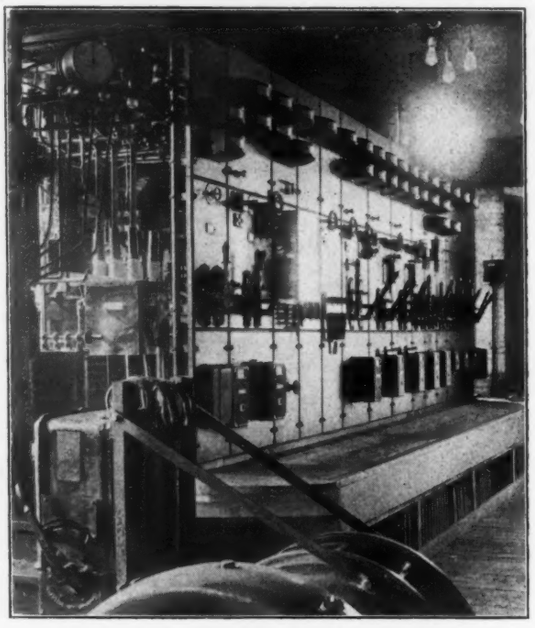


FIG. 4—MAIN SWITCHBOARD, WARREN, OHIO

board, while the sixth panel controls the station exciters. Switching for the 1800-kw Curtis turbine is done from panel No. 7. Panels Nos. 8 and 9 control respectively the 400-kw alternating-current generator and the 500-kw turbo-generator set. From panel No. 10 the feeders for the Ohio Lamp Works of the General Electric Company, the Packard Transformer Company, the Borden Die Works and the Warren City Tank & Boiler Works are controlled. On panel No. 11 are mounted the switches for the outgoing high-tension lines. The next two panels, Nos. 12 and 13, control the single-phase alternating-current residence lighting in Warren. Street lamps are lighted and switched off from panel No. 14.

Besides this main board, there are two auxiliary boards in the station, one being a four-panel direct-current board for controlling two feeders and two small generators. In order to give flexibility to the series street lighting which is plentiful in the city, three plug boards are installed in the station.

No transformer equipment has been placed in this plant, energy being transmitted to the Park Avenue substation, where nine 100-kw, 2200-volt Peerless trans-

formers step up the potential from the generator rating to 22,000 volts for transmission purposes.

Gas-Engine Plant

Just at the rear of the Erie railroad station in Warren is situated the gas-engine plant which formerly belonged to the Hydroelectric & Gas Company. Here a 350-hp two-cylinder, four-stroke horizontal Olds gas engine is belted to a 250-kva, 2300-volt, 60-cycle, three-phase Burke alternator. Excitation for the main unit is furnished by a 25-kw, 125-volt Peerless electric direct-current generator. An 8-hp Olds gas-engine-driven pump supplies compressed air for starting. The gas-engine set is now used only in times of emergency, delivering energy at 2300 volts to three 100-kw Peerless transformers, where it is stepped up to 23,000 volts for transmission. As soon as conditions will permit, the use of the gas engine will be discontinued.

Hydroelectric Plants

On the upper Mahoning River two small hydroelectric stations, known as the West Fork plant and the East Fork plant, deliver energy to the high-tension lines of the company. The station on the west fork is driven by one 34-in. and two 49-in. vertical waterwheels operating on an 18-ft. head. The wheels are geared to a horizontal shaft, which is direct-connected to a 300-kw, 2300-volt, 60-cycle, three-phase alternator made by the Electric Machine Company. The exciter is rated at 15 kw. The switchboard in this plant consists of one generator panel, one feeder panel and one exciter panel. Energy from this station is delivered at 2300 volts to the East Fork plant, where it is stepped up for transmission.

The East Fork plant is driven by three 49-in. vertical waterwheels made by the Dayton Globe Iron Works Company. These wheels operate on a 16-ft. head and are geared to a horizontal shaft which is direct-connected to a 300-kw, 2300-volt, 60-cycle, three-phase generator, a duplicate of the machine in the West Fork plant. The exciter for this unit is rated at 25 kw. Six transformers rated at 100 kva, 23,000 volts, step up the pressure at this station for the outgoing transmission lines.

Further down the Mahoning River just below its junction with Eagle Creek is the Leavittsburg hydroelectric plant. Three 54-in. vertical waterwheels operating on a 9-ft. head are geared to a horizontal shaft, which is belted to a 300-kw, 2300-volt, 60-cycle, three-phase alternator. A 14-ft. flywheel on the same shaft steadies the action of these machines. Excitation is furnished by a 15-kw direct-current generator.

Transmission Lines

Interconnecting transmission lines reach all five plants of the company, the steam and gas-engine station being established on the "factory loop." From the busbars of the main steam plant two 2300-volt transmission lines, one of No. 0000 copper and the other of No. 0 copper, transmit energy to the Park Avenue substation, where it is transformed from 2300 volts to 23,000 volts by nine 100-kva transformers. The buses in the substation are sectionalized so that in case trouble occurs on either outgoing line the other may be used. Both of these 2300-volt lines for factory service can be handled from the main power house by remote-control switches.

At the substation serving the Peerless Electric Company the line is sectionalized with air-brake switches, one set of which is kept open at all times. Any break or other damage occurring on the line may be thus quickly located, and by proper switching continuous service can be restored.

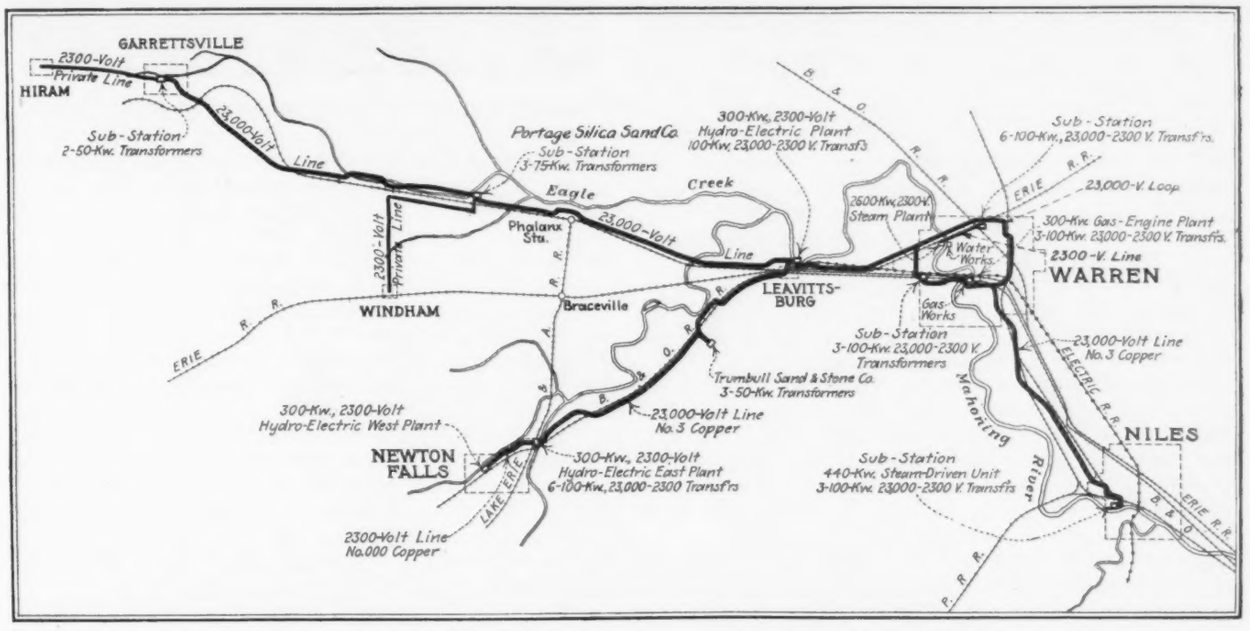


FIG. 5—ELECTRIC-SERVICE SYSTEM IN TRUMBULL COUNTY, OHIO

From the gas-engine plant a three-phase No. 2 copper transmission line carries energy to Niles for street lighting and commercial service. Electric service at Niles was formerly furnished by a steam plant of 440-kw rating, but at present there are six 100-kw transformers at the Niles end of the line. A 2300-volt, three-phase line of No. 1 copper ties in the Leavittsburg hydroelectric plant to the factory loop, and this line is extended through the Leavittsburg station to the East Fork and the West Fork plants at Newton Falls. However, between the West Fork and the East Fork plants transmission is carried on at 2300 volts over a No. 000 insulated copper-wire line. From the East Fork plant to Leavittsburg the line is built of No. 3 copper. At a point about midway the Trumbull Sand & Stone Company has installed three 75-kw transformers and is taking energy for the operation of its quarries.

The most recent construction undertaken by the com-

pany is the line west from Leavittsburg to Garrettsville and Hiram. From Leavittsburg to Garrettsville energy is transmitted at 23,000 volts, and at the midway point between Leavittsburg and Garrettsville a 2300-volt line is taken to Windham and a short spur is run in the opposite direction to the 225-kw substation of the Portage Silica Sand Company.

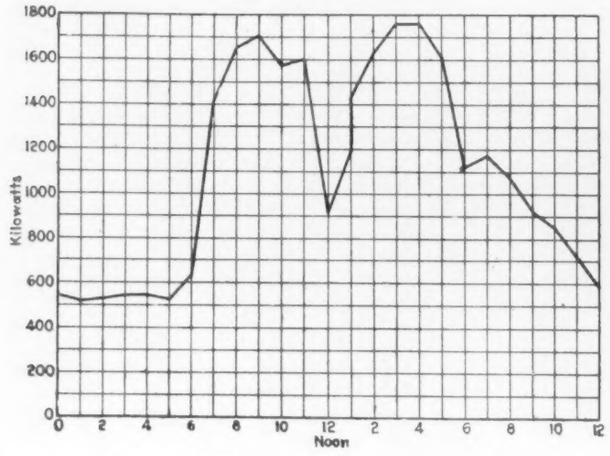


FIG. 6—TYPICAL DAILY LOAD CURVE

The former engine-driven station at Hiram has now been replaced by the utilization of service from a 2300-volt transmission line being erected from Garrettsville to Hiram. This line is owned by a Garrettsville man, Mr. Bruce, who by contract sells energy to the village of Hiram. In order that Mr. Bruce and the village of Hiram may share the energy losses of the transmission line equally, the meters have been placed at the midway point between the two villages.

The pole-line construction used between Leavittsburg and Garrettsville differs somewhat from the usual equilateral triangular spacing of conductors. The top ground wire and one phase of the high-tension line are placed on the top arm, while the other two phases are carried upon the second arm. The cross-arms are 62 in. long and are spaced 3 ft. apart between centers. For signaling a telephone line is carried on a short cross-arm 6 ft. below the lower high-tension arm. A second ground-wire occupies a position just below the telephone arm. All transmission lines of the company are constructed on wooden poles, most of which are about 45 ft. high with 7-in. tops. Wherever practicable the poles have been spaced forty to the mile. On the factory loop railway right-of-way has been followed wherever possible. The location of the majority of the factories on or near railroad tracks has helped to make this plan feasible.

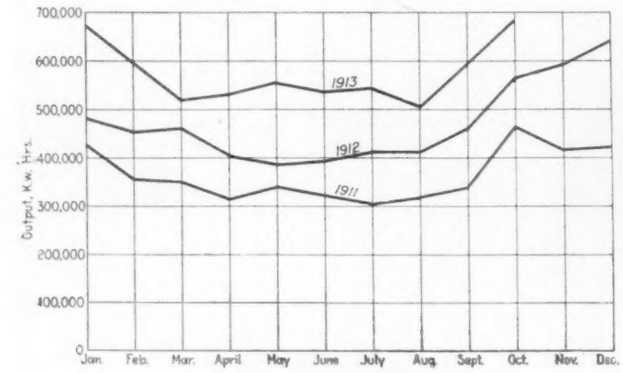


FIG. 7—LOAD CURVES FOR THREE YEARS

"White-Way" Lighting at Warren and Niles

Warren, although now a town of about 15,000 inhabitants, is one of those pretty Ohio communities which grew up around a park-like courthouse square. The streets bordering on this square are well lighted, three-lamp standards having been used on the side of the roadway opposite the park and one-lamp standards on the park side. There are in all about 125 of these ornamental posts in the city. Sixty-watt lamps are employed in the bottom globes, while 80-watt lamps are used in the top positions. In the single-lamp standards 80-watt lamps are used throughout. While the bottom lamps on the three-lamp standards and the single-lamp standards are extinguished at 12 o'clock, the top lamps of the three-lamp standards burn all night. These ornamental posts are spaced from 80 ft. to 100 ft. apart.

FIG. 8—ILLUMINATION ON WARREN BUSINESS STREET

For lighting the outlying districts where ornamental posts were considered too expensive, 815 shaded 80-watt tungsten units are suspended on gooseneck hangers from the poles of the distribution system. All lighting is done from one side of the street, and care has been taken with the alignment of the construction so that the lamps form a straight line when lighted. Practically every street in town is thus lighted, and the illumination is even and well distributed, although many trees border the streets.

The surface intensity of street illumination in Warren is augmented by the numerous electric signs of the local merchants. One of the most notable of these is Warren's slogan sign, a photograph of which is reproduced herewith (Fig. 16). The word "Warren" in the center of the sign is lighted continuously. Then appears the word, "Opportunity" with a question-mark. This is followed by the expression "It's here," and a few seconds later the phrase "The City of Modern Methods" comes

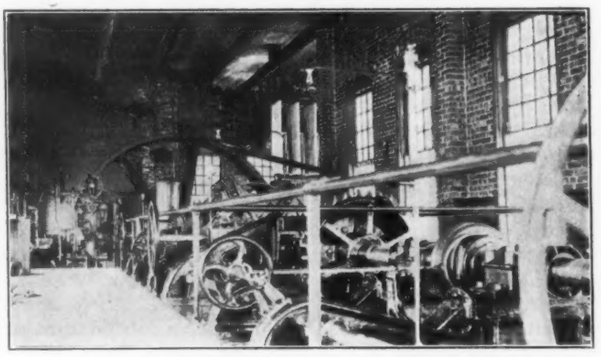


FIG. 9—WATERWHEEL EQUIPMENT, LEAVITTSBURG

to view. The sign is about 50 ft. long and 40 ft. high and contains approximately 3500 five-watt tungsten lamps.

In the city of Niles five-lamp and single-lamp standards are used. Posts are spaced at 100-ft. intervals on both sides of the streets. These standards are about 12 ft. high and each carries a 16-in. globe at the top.

FIG. 10—NIGHT SCENE IN NILES

The circuit for this series lighting is strung on the trolley poles, the method of wiring being rather unique. Above each standard a wood strain is inserted in the circuit and taps are taken from each side of this insulator to the brackets on the capital of the ornamental post. The method is inexpensive and is not at all unsightly where the streets are lined with trees as in Niles.

Commercial Methods and Their Results

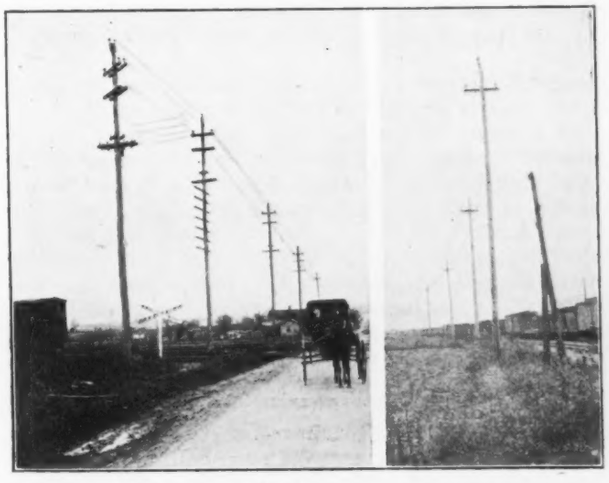
Since June, 1911, the new-business department of the company has conducted four electric-iron campaigns, with the result that approximately 600 irons have been sold in a territory which had already been worked by the competing electric-service companies before consolidation. Amicable relations with contractors have been maintained by avoiding conflicts in the sale of appliances by the company and by referring all wiring jobs to the contractors. In many instances the profit made on appliances sold by solicitors during campaigns was also turned over to the contractors. Although Warren is the home of a widely known gasoline automobile, the little city nevertheless boasts of fifteen electric pleasure cars.

Relying upon electric signs to fill the 6 o'clock dip in the daily load curve, Mr. R. A. Wood, contract agent for the company, has been paying special attention to this branch of the business. A good measure of success has attended his efforts, for nearly every merchant in the city has either a display sign or a well-lighted show window. Even the churches have appreciated the benefits of the electric sign, some having placed "Welcome" signs over their doors.

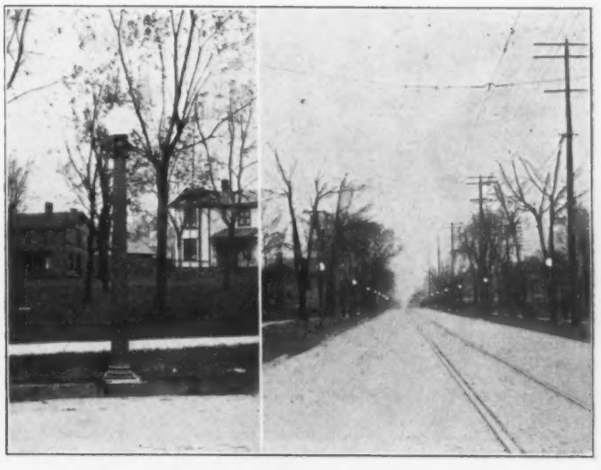
FIG. 13—NIGHT SCENE ON WARREN'S PUBLIC SQUARE

Co-operating with the real-estate men, the central station makes an effort to let no wired property in Warren stand vacant. Cards are furnished by the electric-service company for use in advertising vacant wired houses which are for rent. These cards bear the legend "To Let, Wired for Electric Lights," with a blank space for the realty company's name.

One of the things which impress the visitor to Warren's factory district, especially if on a dark day, is the flood of light emanating from the windows of the rooms containing the aging racks in the tungsten lamp factories. At night light from these windows sometimes illuminates the street and surroundings so brightly that one can read fine print at a distance of 100 yd. These lamps in the aging racks furnish a twenty-four-hour lead for the electric-service company, the demand ranging from 8 kw to 50 kw in the different factories.



FIGS. 11 AND 12—22,000-VOLT TRANSMISSION LINES



FIGS. 14 AND 15—STREET-LIGHTING UNITS, NILES

A typical daily load curve of the steam station and yearly load curves of the system for the past three years show the present demands on the generating equipment and point to the steady growth enjoyed by the company since its formation. For example, the increase in load for October, 1913, over the same month last year was 112,250 kw-hr. The load-factor is now above 50 per cent.

During the past summer the construction department wired a tennis court for night playing, the installation consisting of ten 250-watt tungsten lamps carried on messenger cables. This lighting has proved a great success. The demand was so great for the use of the court (which is situated in a public park) that plans

FIG. 16—WARREN'S "OPPORTUNITY" SIGN

have already been made for wiring six more courts early in the spring.

Meadowbrook Farm Installation

Along the many transmission lines of the company enterprising farmers are using electrical energy for lighting their houses and barns, and in many instances electric motors have been called in to displace the gasoline engine. One of the most complete installations of this kind is that at Meadowbrook Farm near Leavittsburg. The total connected load aggregates 50 hp and electricity is used for threshing wheat, chopping feed, separating cream, lifting hay, pumping water, grinding meat, operating a shearing machine, and driving an electric vacuum cleaner for horses. The owner had formerly used a gasoline engine but is now an enthusiastic advocate of electricity for farm service.

In the home of Mr. M. R. Turner, manager of the farm, sixty-five 60-watt lamps are installed, while the main barn and the horse stable are each illuminated with 40-watt lamps. Other houses and smaller barns on the

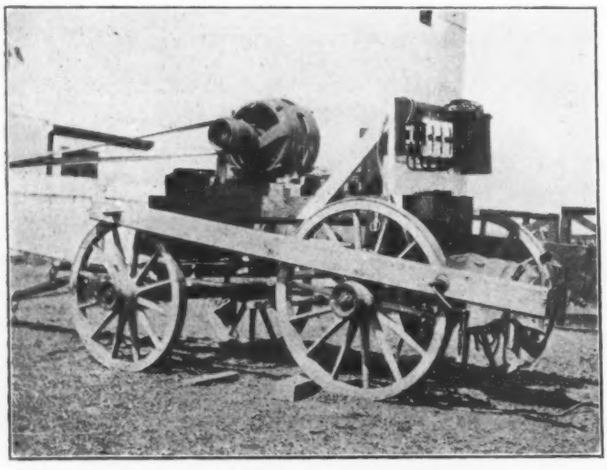


FIG. 17—23-HP MOTOR DRIVING THRESHING MACHINE, MEADOWBROOK FARM

place are lighted by from three to eight lamps, making a total of about 180 lamps in the various buildings on the farm. General illumination of the barnyard at night is provided by three 250-watt tungsten lamps suspended on gooseneck hangers from the platform of the water tank. Heavy work about the farm, such as threshing, filling silos and the like, is done by a 20-hp motor mounted on the running gears of a farm wagon. Connections between the starting panel on the rear of the wagon and the motor are made permanent and a flexible insulated cable is employed for completing connections to the transformer secondary taps.

Among the eight other small motors used about the farm, three 3-hp units drive the milking machines, vacuum pump, dairy appliances and feed cutters; two 2-hp motors drive water pumps and meat choppers, and two fractional-horse-power motors operate the horse cleaners. Motor-driven washing machines, electric irons and other appliances are used in the homes of the manager and tenants. Crocker-Wheeler 220-volt motors are used exclusively in this installation.

According to Mr. R. H. Turner, the average bill for gasoline and repairs on an engine formerly used for pumping and general purposes was more than $25, but now, with electric service at a price ranging from 6 cents to 2.5 cents per kw-hr., the monthly bill is generally about $15. However, says Mr. Turner, the size of the two bills in no way measures the value of the services

FIG. 18—POLE-TYPE TRANSFORMER FOR MEADOWBROOK FARM, AND LIGHTING UNIT ON WATER-SUPPLY TANK

rendered, for now the electric service is used in practically every operation in the day's work.

As evidence of the fact that the motors are money savers it is stated that two silos, one measuring 16 ft. by 36 ft. high and the other 14 ft. by 36 ft. high, were filled at a cost for electrical energy of less than $10 each. Another application recently added was an electrical milking system. A motor driving a countershaft in the dairy house exhausts air from a tank and the "vacuum" is transmitted to the barns through a series of pipes. This system applied to a herd of sixty-five cows effects a saving of $195 per year.

Staff Organization

The heads of each department meet once a month at an informal luncheon to hold a general discussion of the problems that have arisen during the previous thirty days and to talk over future plans. In this way each department keeps in close touch with the others.

The Trumbull Public Service Company is under the management of Mr. George Daugherty. Assisting him are Mr. W. J. Marshall, contract agent, who has recently succeeded Mr. R. A. Wood, promoted to be new-business manager for the Brush Electric Company at Galveston, Tex., and Mr. A. V. Wynne, chief engineer and electrician.

Sag-Temperature Relations in Suspended Conductors

Method of calculating the sag of conductor spans under varying weather conditions with regard to temperature changes. By H. M. Hall

SO many articles upon the subject of sag and temperature have lately appeared in the technical publications that one hesitates to enter the field which has already been so well and ably covered. However, as far as the writer is aware, the matter has never been treated in exactly the following manner, which seems much simpler and more complete than many of the published methods, while at the same time practical accuracy has not been sacrificed to simplicity.

Nomenclature

S = span length in feet.
W = weight per foot per square inch of bare conductor.
W' = weight per foot per square inch of conductor section of loaded conductor.
$f = \frac{W'}{W}$
D_0 = sag to develop elastic limit in unloaded conductor.
D_1 = sag to develop elastic limit in loaded conductor.
D_2 = sag when load goes off, without temperature change.
D = any sag in unloaded conductor $> D_0$.
T_0, T_1, T_2, T = tension per square inch corresponding to D_0, D_1, D_2, D.
L_0, L_1, L_2, L = arc length corresponding to D_0, D_1, D_2, D.
C = elastic deformation due to change in tension.
M = elastic modulus.
a = coefficient of linear expansion per deg. Fahr.
N = deg. Fahr. necessary to change D_2 to D.

From the definition of elastic modulus it follows that

$$T_1 - T_2 = \frac{L_1 - L_2}{S} M \left(\text{very closely; strictly should be } \frac{L_1 - L_2}{L_2} M\right) \quad (1)$$

$$T_0 - T_2 = \frac{L_2 - L_0}{S} M \left(\text{very closely; strictly should be } \frac{L_2 - L_0}{L_0} M\right) \quad (2)$$

But, since $T_1 = T_0$ = elastic limit stress (or any other definite stress),

$$T_1 - T_2 = T_0 - T_1 \quad (3)$$

and consequently:

$$L_1 - L_2 = L_2 - L_0 \quad (4)$$

or

$$L_2 = \frac{L_0 + L_1}{2}. \quad (5)$$

From the well-known arc-length formula

$$L_0 = S + \frac{8 D_0^2}{3 S} \quad (6)$$

$$L_1 = S + \frac{8 D_1^2}{3 S} \quad (7)$$

$$L_2 = S + \frac{8 D_2^2}{3 S} \quad (8)$$

Substituting (6), (7) and (8) in (5) gives

$$S + \frac{8 D_2^2}{3 S} = \tfrac{1}{2}\left(2 S + \frac{8 D_0^2}{3 S} + \frac{8 D_1^2}{3 S}\right) \quad (9)$$

which reduces to

$$D_2 = \sqrt{\frac{D_1^2 + D_0^2}{2}} \quad (10)$$

But

$$D_0 = \frac{S^2 W}{8 T_0} \quad (11)$$

and

$$D_1 = \frac{S^2 W'}{8 T_1} = \frac{S^2 f W}{8 T_1} = f D_0 \text{ (since } T_0 = T_1) \quad (12)$$

Therefore (10) becomes

$$D_2 = D_0 \sqrt{\frac{f^2 + 1}{2}} \quad (13)$$

Equation (13) gives, in very simple form, the sag acquired by the conductor upon the disappearance of whatever external wind and ice load was assumed to produce D_1 and T_1. Of course, this assumes that f becomes unity without change in temperature, but this is not an unreasonable assumption, since the majority of ice loadings occur very close to 32 deg. Fahr., so that a negligible temperature rise is sufficient to cause the ice to disappear.

As far as the writer knows, the sag acquired by the conductor upon the disappearance of the external load has had little or no attention in the current discussions of the general problem of sags. This release sag is, however, of much greater importance than appears to be generally realized, and an accurate determination of it renders much simpler the calculation of the movement of the conductor due to subsequent temperature changes.

Having determined as above the values of D_0, D_1 and D_2, assume a value for the sag equal to D greater than D_2; that is, D occurs at a higher temperature than D_2. Then

$$L - L_2 = \frac{8}{3 S}(D^2 - D_2^2) \text{ (from the arc length formulas)} \quad (14)$$

and

$$T_2 - T = \frac{S^2 W}{8}\left(\frac{1}{D_2} - \frac{1}{D}\right) \quad (15)$$

From the definition of elastic modulus

$$C = \frac{T_2 - T}{M} S \left(\text{strictly} \frac{T_2 - T}{M} L_2\right) \quad (16)$$

The change $L - L_2$ is made up of two parts, that due to temperature and that due to the change in tension caused by the change in sag. That is

$$L - L_1 = SaN - C \text{ (strictly } L_2 aN - C) \quad (17)$$

or

$$N = \frac{L - L_2 + C}{Sa} \quad (18)$$

By means of (14), (15) and (16), (18) becomes

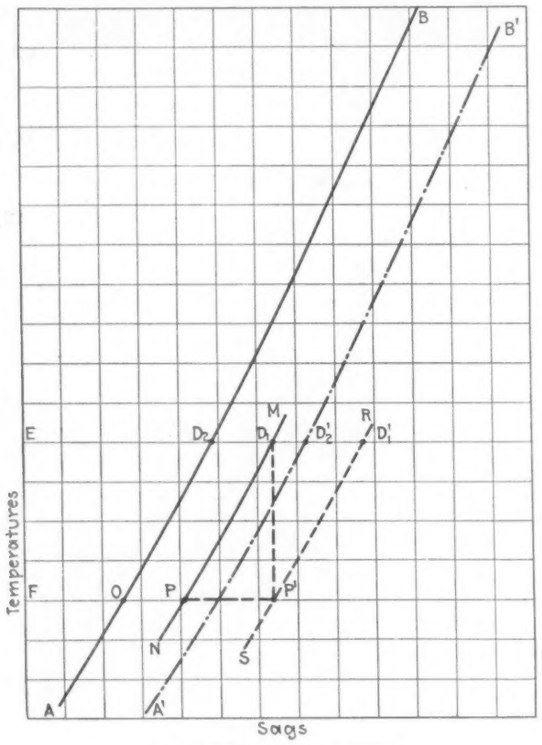
$$N = \frac{8}{3 aS^2}(D^2 - D_2^2) + \frac{S^2 W}{8 aM}\left(\frac{1}{D_2} - \frac{1}{D}\right) \quad (19)$$

Equation (19) thus gives the number of degrees of temperature change necessary to change D_2 to D. If $D > D_2$, N is positive, and shows a rise above the temperature at which D_2 occurs. If $D < D_2$, N is negative and indicates a drop below the temperature of D_2.

In applying the above method to any given conductor, span and loading conditions, the procedure is as follows:

Find D_0 from (11) and (D_2) from (13) and then assign to D several different values greater and less than D_2. With these values of D find from (19) the corresponding values of N. From these values for N and D a sag-temperature curve can be drawn through the point corresponding to the temperature and sag of D_2. This curve will completely define the motion of the unloaded conductor due to temperature rise and fall and can be used by the erecting crew for stringing the conductor.

Under certain conditions the above method should be



SAG-TEMPERATURE CURVE

amplified somewhat in order to avoid stressing the conductor beyond the elastic limit.

Let it be required that the conductor carry a given ice load and at the same time be subjected to a certain fall in temperature below that at which the ice is assumed to form.

In the diagram AB is a sag-temperature curve drawn as above, D_2 being the release from D_1 such that T_1 is the elastic limit. E is the temperature at which D_1 and D_2 occur and F is the assigned minimum temperature. Through D_1, parallel to AB, draw the curve MN. P is the sag attained by the loaded conductor at the minimum temperature, and here the tension exceeds the elastic limit by the ratio of $\frac{D_2}{O}$.

In order to find the minimum loaded sag which will not exceed the elastic limit, construct the right triangle $D_1, P\,P'$, thus locating P' at a sag equal to D_1. Draw RS parallel to MN through P'; D'_1 will then be the new maximum loaded sag, at the temperature of ice formation. From D'_1 locate D'_2 so that $D'_2 = \frac{D'_1 D_2}{D_1}$. Through D'_2 draw $A'B'$ parallel to AB. $A'B'$ will then be the sag-temperature curve for the bare conductor, so taken that the loaded sag can decrease from D'_1 to P' without exceeding the elastic limit.

An entirely similar method can be employed in case it is desired to consider a wind load continuing during a considerable temperature change.

Thus the above method completely covers the motion of a suspended conductor caused by temperature changes, whether it be entirely unloaded, loaded and unloaded at a definite fixed temperature, or be subjected to a wind or ice load simultaneously with a given temperature variation.

The above-described method has been very carefully checked by experiments on a 660-ft. test span, and the agreement between actual and calculated results was very satisfactory, being well within the unavoidable experimental errors and, indeed, far closer than the accuracy maintained by the ordinary line gang. This close agreement between theory and practice shows that the practical accuracy of the above method is not impaired by the use of span lengths, instead of arc lengths, in equations (1), (2), (16) and (17). This was to have been expected from general considerations, since, with a 700-ft. span and a 20-ft. sag, for example, the difference between arc length and span length is only 0.2 per cent, while it is proportionally less with small spans and sags.

A Remotely Controlled Water-Power Plant

The National Copper Mining Company is to electrify its property in the Cœur d'Alene district of Idaho and will purchase energy from the Washington Water Power Company under a contract which makes it desirable for the mining company to maintain its load at as high a power-factor as possible. The mining company has water-power rights from which approximately 600 hp can be developed, and besides utilizing this energy to supply part of the power requirements of the mine and mill, the generating stations will also be used to improve the system power-factor.

To develop the 600 hp above mentioned two hydroelectric plants will be built on Dead Man's Creek, and installed in each will be an impulse-type waterwheel driving a 200-hp, three-phase, sixty-cycle generator. As no attempt will be made to regulate the load taken by these plants, the waterwheels will not be supplied with governors of the ordinary design but overspeed governors will be installed serving to deflect the waterwheel nozzles in case, through accident, the load on either or both of the plants should be disconnected, allowing the wheels to race.

When the machines are operating in parallel with the power company's lines, the frequency delivered by the latter will necessarily fix the speeds at which the local generators can run, and they will then take as much of the mining company's load as the water running through the waterwheels will permit. By adjusting the fields of the generators a very high power-factor will be secured on the entire load.

One of these hydroelectric plants has been designed for operation in the usual manner by an attendant in the station. The other plant is planned to be run without attendance, the generator being connected to or disconnected from the load from a distant point (the compressor station at the mine) by means of electrically operated switches. The governor on the waterwheel will also be controlled by the same mechanism which operates the switches, so that the plant can be stopped or started without anyone going near it.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

The Fruits of Unified Service

The Louisville Gas & Electric Company is running a series of newspaper advertisements of what might be called the "good-will" type. The latest shows some of the advantages of the consolidation of the numerous companies formerly in the field and reads in part as follows:

"Formerly in Louisville the best efforts of the electric and gas companies were devoted to fighting one another; to getting the business easiest to serve and secure, while the interests of the small householder received less attention.

"Unification means that the ingenuity, money and energy formerly exerted in trying to capture another company's business will be devoted to serving the people better, more comprehensively, more adequately and at lower cost.

"Unification has produced a program of vast improvement to the manufacturing and distributing systems in Louisville, of which the enlargement of the electrical production capacity of the Waterside power station by more than 12,000 hp is the first step."

Electrical Pages Resumed at Cleveland

For four years past the Cleveland (Ohio) Electric Illuminating Company has published an electrical page in the daily newspapers during the seasons of the year in which advertising is thought to be timely. Resuming this educational campaign after a brief interval, Mr. M. E. Turner, contract agent for the Cleveland company, says that the concerted effort afforded by such publicity cannot fail to produce results.

Electrical pages are now being printed in three of the four daily papers published in the city. The scheme followed in each is practically the same. Little stories on electrical subjects of popular interest are "run" in the center of the page, and about these are grouped the appliance and wiring advertisements of the electric-service company and other electrical firms. Manufacturers of appliances are also notified when their particular lines of goods are to be featured in the electrical page. Thus they have a chance to take increased advertising space calling attention to their own products. The idea of concerted effort in advertising is kept continually uppermost.

Small-Town Electric Service from Flour Mills

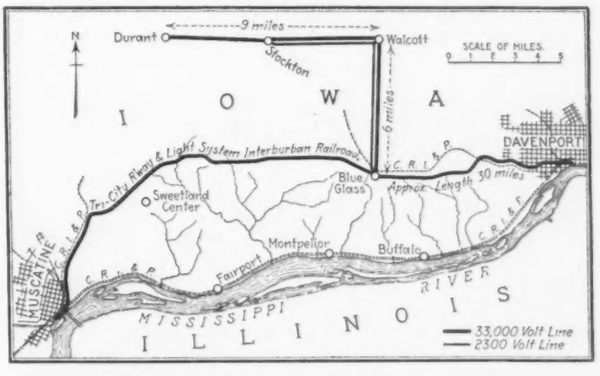
Some of the possibilities of central-station operation in connection with other industries in small towns are indicated by the expansion of the electric-lighting business of the Dawson Milling Company, of Dawson Springs, Ky. Several years ago a lighting plant was put in with a rating of less than 10 kw. The demand for service gradually increased until a 60-kw generator was installed a few years ago. The Dawson Light & Power Company has now been organized to operate the lighting business, which has grown so large as to make its separation from the milling business desirable. E. A. Stevens, head of the mill company, is likewise manager of the lighting company. The latter company plans to increase its generating capacity from 60 kw to 100 kw, and also to change from direct to alternating current.

An interesting feature of the business is the fact that Dawson Springs is a summer resort well known in its section. The company has built up a big business among patrons of the hotels, furnishing electric fans at the rate of $2.50 a month, $1.50 being for rental and the other $1 for maintenance. Several hundred of these fans are thus kept going all during the summer months.

The combination of flour mills and electric-light plant is popular in other Kentucky towns, Mr. W. E. Arnold, a miller of Owenton, having just installed a 30-kw generator and storage-battery equipment for lighting his community. The James Clark, Jr., Electric Company, of Louisville, furnished the equipment.

Co-operative Electric Threshing by Iowa Farmers

With the completion of 15 miles of 33,000-volt line and of 10 miles of 2300-volt circuits centering about the town of Blue Grass, Ia., and reaching Wolcott, Stockton and Durant, the People's Light Company, of Davenport, Ia., has begun a campaign for securing rural customers. Along the 2300-volt line extending as shown from Wolcott to Blue Grass and to Stockton twenty-two farmers have already been connected. A 33,000-volt outdoor substation has been erected at Wolcott, and from this equipment are fed the 2300-volt circuits leading south and west from the city. Customers' motors are connected to 220-volt taps from the transformers, and lighting circuits are operated at 110 volts.



TRANSMISSION LINES IN VICINITY OF DAVENPORT, IA.

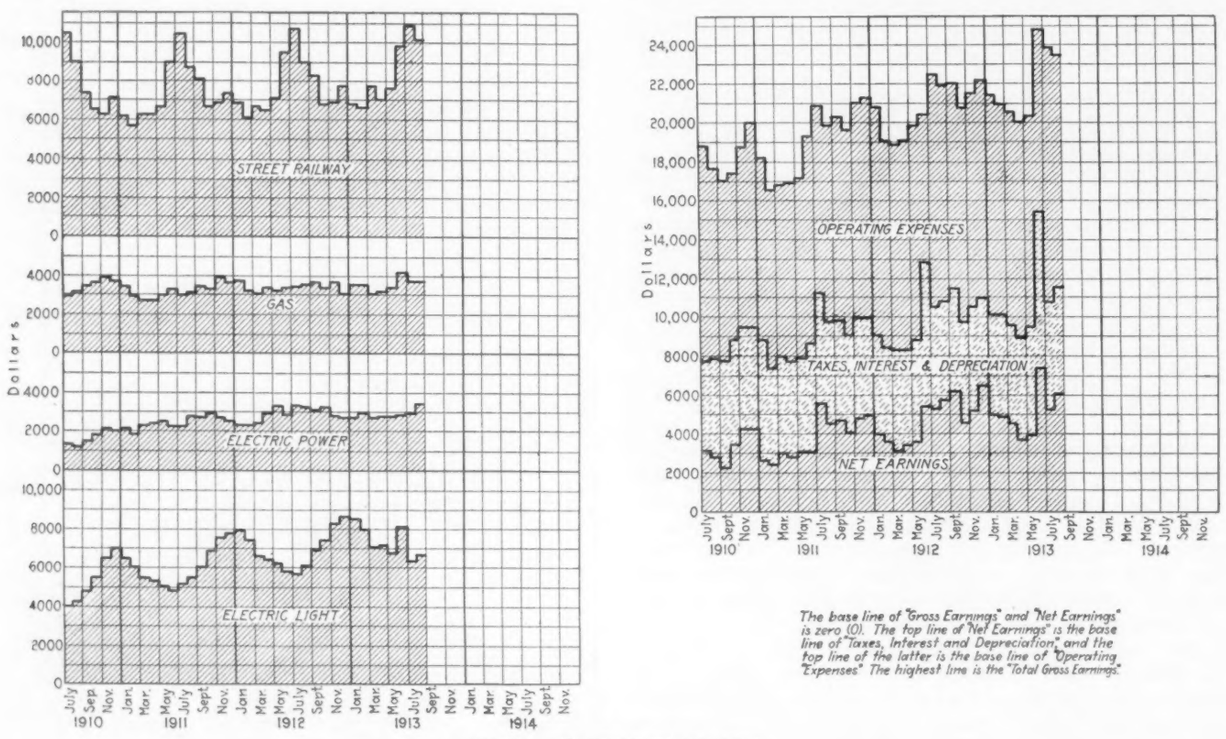
All lines and transformers for the rural customers have been furnished by the electric-service company, the customers in return guaranteeing a four-dollar minimum monthly bill. When a resident living at such a distance from the company's lines that an extension would not be justified desires service, the company offers to erect a line to his property at a cost of $7 a pole. The charge for energy for service in this case is

the same as that to other rural patrons. Meter reading is taken care of by a local garage man in Wolcott who charges the company only for the actual time he is engaged in his monthly rounds.

Forming a co-operative association, the farmers along the lines have determined to do their 1914 threshing electrically. A 20-hp motor will be purchased by the association and mounted with its control equipments on a wagon so that it may be taken from one farm to another as the work of the "threshing ring" progresses.

Manager's Graphic Report to Board of Directors

The manager of a prosperous utility in the Northwest has hit upon a compact and novel plan for presenting his monthly report to the board of directors. As is very often the case, many of the owners have little knowledge of "kilowatts," "kilowatt-hours" and other electrical units, although they show a very keen appreciation of any increase in the net earnings of the company. In this particular instance the electric-service company operates electric-lighting, street-railway and gas properties. At the left of the sketch herewith the income from each branch of the business is represented by a separate graph, while the right half of the drawing shows the operating expenses, interest and depreciation, and also the net earnings for each month.



The base line of "Gross Earnings" and "Net Earnings" is zero (0). The top line of "Net Earnings" is the base line of "Taxes, Interest and Depreciation" and the top line of the latter is the base line of "Operating Expenses." The highest line is the "Total Gross Earnings."

MANAGER'S GRAPHIC REPORT

The work of getting out such a report as this is not so great as might appear at first thought, for a tracing has been provided, and as the reports for the month are finished the results are added to those already on this sheet and then transferred to as many blueprints as are needed. In addition to the convenience afforded by such a graphic chart, this system shows at a glance all the past records of the company.

The rather consistent peaks of net earnings in June show in a way the conservative financial policy followed by the management, for in this month the fiscal year of the company is brought to a close. Instead, however, of there being always a few forgotten debts to drag down the June showing, the balance generally gives a comfortable sum to be added to the net earnings column.

Getting Down to "Brass Tacks" in Selling Signs

A glance at many typical central-station load curves will show the need of business to fill the depression occurring about 6 p. m. between the afternoon motor load and the evening lighting peak. Many managers have realized this condition and have set their new-business men at work selling electric signs and increasing window illumination to flatten out the curve. Selling signs, however, is the work of a specialist who knows the sign business and who is capable of presenting designs and ideas with which the average central-station solicitor is unfamiliar. Although lighting-company salesmen can often talk to prospective customers and create enthusiasm, the sign man submitting concrete designs and talking facts about signs is the one who has least difficulty in closing contracts.

In the past one of the main objections which central-station men have urged against electric-sign salesmen was that too often the sign man visiting a city would "run" into the lighting company's office, inquire if there where any live "prospect," appear piqued if several signed orders were not handed to him, and then leave on the next train without himself making an honest effort to secure business which the central-station man felt sure a good sign salesman could get. One sign manufacturer, realizing the fallacy of this "high-spot" method of selling his wares, is now placing competent salesmen in the medium-sized cities of the Middle West with instructions to "remain there and get the business." In most cases the local lighting company supplies the sign company's man with lists of live prospective customers and other data and gives him desk room in its own office so that he may have permanent headquarters and get in touch with local conditions.

Where this scheme of selling has been tried its success has been notable. In one Iowa City of 50,000 inhabitants the sign salesman has averaged nearly three signs a week for a period of six weeks, and in a Missouri city with a population of 85,000 fifty-eight signs were sold within less than a year. The central-station salesmen and the sign specialist are working hand in hand in these cases, and the results of true co-operation are making themselves manifest.

Queen Carnival's Electric Float

One of the features of the parade held during the carnival at South Bend, Ind., not long ago was the artistically decorated electric truck of the Indiana &

ELECTRIC CARNIVAL FLOAT AT SOUTH BEND, IND.

Michigan Electric Company, which supplies central-station service in South Bend and nearby cities. Appropriately enough, this electric float was used for the purpose of conveying "the queen of the carnival" and her retinue of maids of honor, and as it moved majestically through the streets in the night procession it presented a truly regal appearance.

One of the company's Studebaker trucks was utilized, its commercial outlines being hidden by soft blankets of white flowers and festoons of immortelles. Scattered through the decorations and in the flowers on the columns were dozens of varicolored electric lamps. The columns and throne and even the parasol of the flower girl were also outlined with these miniature units. Energy to operate the decorative lamps was obtained from a separate storage battery carried on the truck for the purpose.

The truck was used in the evening parade, and its tasteful decorations and attractive passengers made the display easily the prize-winner of the procession.

Rewards for Prospective Customers

During the month of January the Pittsfield (Mass.) Electric Company has been conducting an active washing-machine campaign with the aid of the manufacturers of the devices, local contractors, the department stores and the employees of Pittsfield electrical concerns, including the central-station itself. Two types of machines were handled—the "Thor Electric," selling at $85 complete, installed in the house, but not including any wiring, and the "Red Electric," installed under the same conditions, at $50. Customers who did not desire to pay cash were permitted to deposit $10 on receiving the machine and to pay $1.50 a week thereafter. A week's free trial was offered to any one expressing a desire to try one of the devices.

With the beginning of the new year the Pittsfield company offered to give $5 in gold to any one of its employees who turned in the name of a prospective customer who afterward purchased a washing machine. The award was collectible as soon as the first $10 was paid on the account. The same offer was open to local contractors and to their employees.

A customer purchasing a washing machine was also granted $5 credit for every washing machine he was able to sell, provided that the company's representative was not already working on the case.

In connection with this washing-machine campaign, according to Mr. H. W. Derry, contract agent, the manufacturers furnished cuts for newspaper advertising, fliers, post cards (some written in Chinese), billboard posters, etc. Literature was inclosed with monthly bills sent to customers, besides being distributed among company employees in the effort to reach persons not users of electricity.

During the first week of the campaign names of more than 100 prospective customers were handed in to the new-business department, and it is expected that responses will continue to be received at the same rate during the campaign. Advertisements were run in the local newspapers each day, and before the campaign was started all the electrical contractors of the city were invited to a discussion of the plan of campaign and their hearty co-operation was solicited.

Electric Cooking Tests at Kansas City, Kan.

What is said to be the first electric show conducted by a municipal electric-lighting plant was held in the city hall of Kansas City, Kan., during December, 1913. At various sessions during the week visitors at the

ELECTRIC COOKER AND APPLIANCES ON EXHIBITION AT KANSAS CITY, KAN.

show were addressed by Mayor C. W. Green; Mr. L. H. Chapman, commissioner of water and light, and Mr. F. E. Williams, chief electrician, of Kansas City, Kan. Short talks were also given by Prof. G. C. Shaad, Kansas State University; Mr. G. A. Hughes, Chicago; Mr. Allen Pratt, Chicago, and Mr. Kenneth Rennie, Kansas City, Mo.

Of particular interest were the electrical cooking tests conducted as a part of the show, as well as other tests made just prior to the opening of the exhibit. The purpose of these demonstrations was to furnish to visitors authentic information on the cost of electric cooking in Kansas City, Kan., where the municipal plant's rate for electrical energy used for cooking is 3 cents per kw-hr.

The tests made before the opening of the exhibition were not conducted on a strictly scientific basis, but an attempt was made to ascertain the actual cost of the usual electric cooking operations as performed by the average American housewife. Apparatus borrowed from several manufacturers was placed in the homes of eight representative families, and the women doing the cooking made records of the food cooked and the time required for each operation. The meters in these homes were read daily by employees of the central-station company. No attempt was made to place the apparatus in the hands of experienced operators and the only instructions given merely stated that for economical operation the cooking devices should be disconnected from the line as soon as any operation was completed.

TABLE I—TESTS OF ELECTRIC COOKING IN PRIVATE HOMES

	Energy in Kw-hr.	Cost in Cents
Open Disks or Plates:		
Rendering 9.5 lb. lard (on two disks, starting cold)	1.165	3.495
Frying 0.5 lb. steak (cold disk)	0.2491	0.74
Boiling 0.5 gal. potatoes	0.666	1.998
Boiling 1 qt. water (cold disk)	0.216	0.6482
Boiling 1 gal. water (cold disk)	0.4163	1.25
Frying 4 eggs and 4 slices of bacon, boiling 2 qt. of water	0.66	2.00
Frying 0.75 lb. veal steak and 9 medium potatoes, warming 1 can of corn, 1 qt. tea and boiling 2 gal. of water	2.33	7.00
1 lb. steak, three eggs fried, 5.5 lb. chicken, twelve medium potatoes, gravy, 1 qt. tea, boiling 2 gal. water	4.00	12.00
Frying twelve pieces of mush, four eggs and six medium potatoes; 1.5 qt. coffee, boiling 2 gal. water	2.00	6.00
Ovens or Semi-Inclosed Cookers		
Baking twelve medium biscuits	0.408	1.225
Baking six large potatoes	0.408	1.225
Baking twelve medium biscuits and six large potatoes together	0.45	1.35
Roasting 2 lb. meat	0.733	2.20
Baking large loaf corn bread	0.596	1.79
Roasting 4 lb. meat and baking six large potatoes together	1.00	3.00
Inclosed or Air-tight Cookers with Compartments		
1 qt. beans, 2 qt. mush, 0.5 lb. round steak	0.80	2.40
5.5 lb. chicken, twelve medium potatoes, toasted bread	1.00	3.00
4 lb. roast, six large potatoes, 1 qt. tea	0.50	1.50
3 lb. ham, twelve potatoes, small head cabbage	0.50	1.50
Six pieces of bacon and four eggs	0.20	0.60
1.5 lb. steak, six potatoes	0.50	1.50
2 lb. steak, twelve potatoes, 1 qt. spaghetti	0.90	2.70
4 lb. roast, 1.5 lb. fruit pudding, 1 qt. scalloped potatoes	0.90	2.70
3 lb. pork roast, six large sweet potatoes, can of corn, warming 1 lb. fruit pudding	0.90	2.70

TABLE II—ELECTRIC-COOKING TESTS MADE AT AUDITORIUM

	Energy in Kw-hr.	Cost in Cents
1 peck potatoes, thirty large sweet potatoes	3.00	9.00
5 lb. bass, one chicken	1.00	3.00
Coffee for thirty persons	0.50	1.50
Baking two loaves of bread	0.75	2.25
6 lb. roast, four loaves of bread	1.75	5.25
4 lb roast, two loaves of bread	2.00	6.00
Twenty-four rolls (hot oven)	0.25	0.75
4 lb. roast	1.50	4.50
Six large potatoes alone	1.00	3.00
Baking cake (hot oven)	2.00	6.00

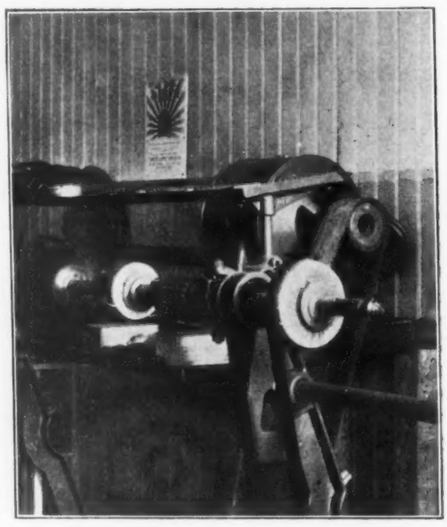
Results of the tests were given to the public with the cost in cents of each operation, the energy consumption being also indicated as shown in the accompanying tables. Three types of cookers were used on the tests, namely, open disks or plates, ovens containing heating disks or plates, and inclosed cookers which were practically air-tight.

In addition to the results given in the tables certain instances were found where an especially economical housewife had made a record for low cost. Among these was the case of a family of three, where one week's cooking was done electrically at a cost of 73 cents; another family using an inclosed cooker operated the appliance for one week at a cost of 19.5 cents; in another home three dinners for four persons were cooked at an energy cost of but 8 cents. In discussing the sentiments expressed by the housewives whose assistance made the tests possible, Mr. F. E. Williams, chief electrician for the plant, says that without exception all were high in their praise of the electrical apparatus, the semi-inclosed and inclosed cookers meeting with especial favor.

Data from tests made by demonstrators at the electric show are given in Table II.

Electrifying the Shoe-Repair Shop

Electric drive is rapidly coming into favor as a means of lightening the toil of the craftsman in footwear repairs, and many outfits of buffing, trimming and polishing tools are now being equipped along the lines illustrated herewith. This class of motor service is particularly well adapted to city shoe-repairing establishments where a large volume of business has to be handled in a limited time. In the installation shown, which is operated by a 3-hp, 220-volt General Electric motor, the tools driven include a finishing shaft for heels and bottoms, bottom pad, bead wheel, heel pad, edge setter, buffing roll, heel breaster, four-part trimmer, heel pad and a Goodyear rapid stitcher. The apparatus is all mounted in a common frame and is equipped with suitable clutches to cut down the power requirements when not in use. A blower for the removal of leather dust is also included. In the plant illustrated, which is that of the "Goodyear Shufix," Boston, the motor is compactly mounted on a timber platform supported by wall posts at one end and by metal clamps attached to the bar of the repair outfit at the other. A 4-in. motor pulley and a 10-in. main shaft pulley are required. Energy is supplied from the local Edison mains and the repair machinery is leased by the United Shoe Repairing Machinery Company, Boston.



COMPACT MOTOR INSTALLATION IN SHOE-REPAIR SHOP

Illumination and Wiring

A Giant Electric Sign for the Scranton Schools

According to reports coming from Scranton, Pa., it is contemplated to erect there one of the largest electric-sign displays ever built. The sign planned will be 420 ft. long and 48 ft. high, with 12-ft. letters reading "International Correspondence Schools. We Teach the World." When this sign is erected, Scranton, according to the Scranton Electric Company, will have both the largest electric sign and the largest school in the world.

Lamps and Lighting of the Future

At the Jan. 13 meeting of the Washington Section of the American Institute of Electrical Engineers, Dr. Herbert E. Ives, of the United Gas Improvement Company, Philadelphia, Pa., gave an illustrated talk on the topic "Lamps and Lighting of the Future." In speaking of high efficiency in illuminants Dr. Ives pointed out that in order to produce an efficient illumination advantage must be taken of selective radiation rather than black-body radiation. This he illustrated by several energy curves. He then told Charles Lamb's story of the origin of roast pig and declared that at present we are doing as the old Chinese who set fire to their houses in order to roast their pigs; we are virtually burning down our houses in order to get a small amount of visible radiation. Dr. Ives said that the efficient selective radiation of the firefly is not so efficient as it seems, although it is much more efficient than any present-day illuminant. He discussed daylight illumination from windows and showed several schemes by which the artificial equivalent of daylight illumination from windows can be produced. During the day, as the speaker demonstrated, the lower parts of an interior are brightest, while at night, with ordinary so-called indirect illumination, this order of things is reversed and it is the upper part of the room which is flooded with light.

To illustrate the crudeness of present lighting installations Dr. Ives said that if a blind person were brought into a room illuminated by daylight and the intrinsic brilliancy of the objects and the walls of the room were represented by paper of different thickness pasted on the objects and walls the thicknesses of paper required would vary from thin tissue paper on the walls to heavy cardboard on the windows. If, however, the blind man was brought into a similar room lighted by electricity or gas, the paper gradations would range from the thickness of a piece of tissue paper to long spear-like projections and the shocks which the blind man would experience by bumping against these would be similar to the shock given the eye of a person looking at the source of illumination.

In conclusion, Dr. Ives said that whenever the needs of the public become urgent for any commodity its development is sure to follow and he made the prophecy that in the near future illuminants will be devised to give luminous outputs as high as 50 to 60 candles per watt.

Discussion

In the discussion of the paper Mr. C. B. Mirick pointed out that the selective radiation of the firefly, in which the radiation is confined to one particular portion of the visible spectrum, gives a monochromatic light, and he asked whether this light would be desirable from a color standpoint. Dr. Ives answered that for some uses the color would be desirable, and that where it was not desirable light from other monochromatic sources could be combined to give the color desired. Mr. Mark Woodward pointed out how monochromatic light might permanently injure the eye. Mr. Irving G. Priest said that daylight illumination from windows has been in use only a few hundred years while daylight illumination from the sky is thousands of years old. From this comparison he concluded that perhaps the eye is better accustomed to bright overhead lighting than illumination from the lower parts of a room.

An Ornamental Transformer House

The building shown in the accompanying illustration might well be mistaken for a bell tower, the neat brick base and stucco finish and the steep gable roof with its ornamental bargeboard and the louver in the gable lending a belfry effect. Amid its rustic environs one

TRANSFORMER HOUSE IN DENMARK

would almost aver it to be a feature of some quiet village from which a tolling message could be sent forth periodically to the neighborhood. But the building, as the wires and arresters indicate, serves a very practical purpose. The structure is a transformer house and is located near Fredericia, Denmark. It merely goes to show what can be done, and is done in Denmark, to help beautify the surrounding country by means of suitably designed buildings.

House-Wiring Campaign at Louisville, Ky.

The Louisville (Ky.) Gas & Electric Company has begun a house-wiring campaign which is expected to bring good results. Investigations made by Mr. E. L. Callahan, who is in charge of the new-business department, have indicated that the field for development in Louisville, in spite of the competitive conditions previously existing, is unusually large. It is believed that between 30,000 and 40,000 dwellings are still without electric service, and a sharp drive for business is to be made in the case of these.

Half-page advertisements in the newspapers started the campaign, while following this display the force of solicitors was considerably augmented. The company has arranged to have the fixtures and wiring installed at its expense, the payments to be collected from the customers along with the charges for service during the twelve months succeeding. It is expected that the campaign will continue at least a year.

A "Show-Me" Window-Lighting Campaign

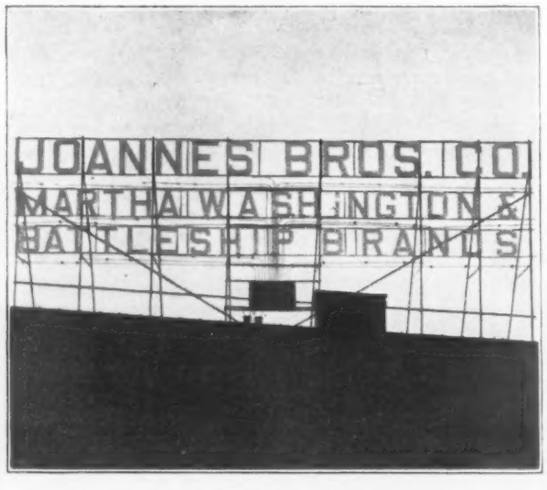
A campaign for proper and more efficient window lighting which bears all the earmarks of real Missouri endeavor is now being carried on by the new-business department of the Kansas City (Mo.) Electric Light Company.

When told that their methods of lighting window displays were not only inefficient but failed to display the goods at their best, the merchants of the city, like true Missourians, demanded that they be "shown" the better way if one existed. And the new-business department, being also imbued with the Missouri spirit, did show the merchants the better way.

Purchasing complete outfits of reflectors and proper lamps for each window, the electric-service company, with the help of the local contractors, installed the equipment for the merchants outright, asking only the latter's permission to make the change. If when the change was completed the merchant was not better satisfied with the new installation than he had been with his previous method of lighting, no charge was made. In all cases, however, the effect created by the improved illumination was so marked and showed the goods to so much greater advantage that the merchants willingly defrayed the cost and accepted the installations from the company.

Grocer's Electric Roof Sign

The Joannes Brothers Company, Green Bay, Wis., is one of the largest wholesale grocery firms in the Northwest, having a floor space of approximately 143,000 sq. ft. To advertise some of its leading brands, the company recently installed a large roof sign containing 709 five-watt tungsten lamps. The display measures 53 ft. long by 23 ft. high, and is controlled by a flasher. First the name of the firm appears and remains lighted for a moment, after which the two lower lines are flashed on. The entire sign is then extinguished for a few seconds, and then all three lines come on simultaneously, remaining lighted until the start of the next cycle.



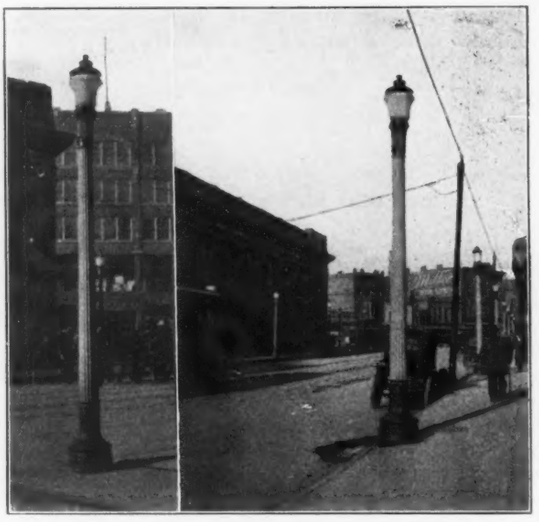
ROOF-TOP SIGN OF WHOLESALE GROCERS

The Green Bay Gas & Electric Company, which furnishes energy to operate this sign, offers a flat rate for show windows, electric signs, etc., which are lighted at dusk and turned off at 11 p. m. The monthly charge is made equivalent to the cost of the watt-hours consumed by the installation, burning four and one-half hours nightly, at the rate of 6 cents net per kw-hr.

Inverted Flame-Arc Lighting at Milwaukee

Work of installing the first two blocks of Milwaukee's new inverted flame-arc lighting system has been completed, although the finished installation will when completed comprise more than 200 lamps.

The lamps, which are a recent product of the Adams-



STANDARDS WITH INVERTED FLAME-ARC LAMPS

Bagnall Electric Company, are of the series type and are rated at 3500 cp each. Spacings of 50 ft. to 60 ft. have been used between the ornamental corrugated shafts which support the lamps at a height of about 15 ft. above the sidewalk. The standards are both simple and graceful in design.

According to the plan upon which these lamps have been installed, the Commonwealth Power Company purchases the units, supplies energy for lighting, and maintains the lamps. In return the electric-service company collects 15 cents per front foot per month from each merchant on the improved thoroughfare.

Methods of Lighting a Small Residence

A paper entitled "The Lighting of a Simple Home" was read by Mr. A. L. Powell before the New York Section of the Illuminating Engineering Society on Jan. 8. The author gave an account of changes made in the fixtures, glassware and lamps constituting the lighting equipment of an apartment. The house was originally provided with an assortment of carbon and graphitized-filament lamps of various voltages. The total connected lighting load of the original installation was 800 watts. As arranged at present, use is made throughout of tungsten lamps, and the connected lighting load is 555 watts.

The original lighting equipment of the porch consisted of a ceiling-type holder with a crystal-ball globe roughed inside and a 50-watt clear carbon lamp. The lamp was replaced by a 10-watt clear tungsten lamp and the globe by an opalescent inclosing ball of an attractive design roughed outside. The front hall, a small room having a floor area of 45 sq. ft. and a white ceiling and dark-green walls, was originally equipped with a combination gas and electric fixture. The 50-watt clear carbon lamp formerly used was replaced by a 10-watt clear tungsten lamp, the clear glass shade by a pressed opalescent glass reflector, and the inclosed ball by an acorn-shaped opalescent inclosing unit roughed outside.

In the living room, where comfort is especially desirable, a semi-indirect system of illumination was substituted for the original four 50-watt clear carbon lamps and shades. This room has an area of 170 sq. ft. The fixtures were replaced by pressed opalescent bowls roughed outside and antique in finish, brass chains suspending the bowls. Sixty-watt clear tungsten lamps, which are about 7 ft. 6 in. from the floor, are used. A baseboard receptacle was also installed to supply an iridescent glass portable lamp placed on the music stand. In the body of this lamp is a 15-watt clear round-bulb candelabra-type tungsten-filament lamp; in the base there is a 15-watt clear tubular-bulb candelabra-type tungsten lamp. On the piano is a brass portable lamp, with a matte aluminum interior reflecting surface and a tubular 25-watt tungsten lamp.

In the illustration herewith is shown the arrangement of accessories in the dome used in the dining room. An amber art-glass hemispherical dome is hung 4 ft. 9 in. above the floor and is equipped with two 50-watt clear carbon lamps in sockets placed at angles and controlled by a wall switch. As it was desired to use various electric cooking utensils and no baseboard or floor receptacle was available, one of the sockets in the dome is utilized for this purpose. The attachment cord is passed through an opening in the top of the dome. When not in use this cord is coiled about the supporting rod and is hidden from sight by the decorations at the top. A 45-deg. socket was substituted for the second socket, and a clear 60-watt tungsten-filament lamp with a clear prismatic reflector furnishes the illumination. The entire base of the dome is covered by a screen of light yellow messaline held in place by a flexible wire ring as shown. An art-glass window in the wall above the buffet in this room is illuminated from without by three 15-watt clear tungsten lamps in a mirrored trough reflector. When the window is lighted the room has the effect of receiving a flood of sunlight, for the glass is of a warm hue and the reflector is so constructed as to give a relatively strong directional effect. The intensity on a 3-ft. horizontal plane, with the room illuminated by the window, is very low near the wall, rises to a maximum at about 4 ft. out, and then gradually decreases.

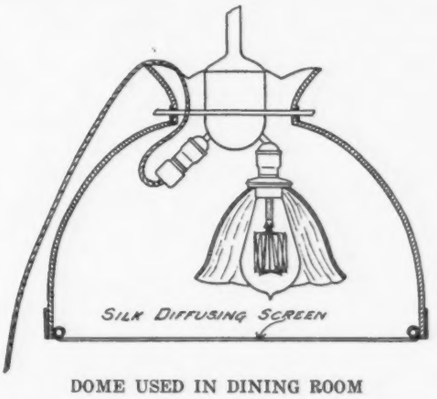
In a room called the "den" used for reading, playing cards, writing, etc., a totally indirect unit is now used consisting of a one-piece mirrored glass reflector in a casing of an Egyptian design having a sand-blasted finish and equipped with brushed-brass high lights. The chain suspension is of such a length as to bring the lamp 7 ft 3 in. from the floor. A 100-watt clear tungsten lamp is used.

The old equipment in the pantry, consisting of a straight-pipe combination gas and electric fixture with a shade and a 50-watt clear carbon lamp at an angle of 45 deg. with the vertical, 6 ft. from the floor, was replaced by a canopy and a nipple, with an indirect shade holder, holding a cased opalescent bowl-shaped glass reflector. A 15-watt clear tungsten lamp is now used.

The original equipment of the bathroom was a gas and electric combination bracket 5 ft. 6 in. from the floor, with a crystal shade and a 50-watt clear carbon lamp. The fixture was replaced by a bracket in the form of an L, with the key socket pointing upward, holding a 25-watt clear tungsten lamp and a bowl-shaped opalescent glass reflector. At the right side of the mirror a cylindrical metal reflector with a right-angle pull socket and a 25-watt all-frosted tungsten lamp in a tubular bulb were installed. This unit is used only while shaving.

In one of the original bedroom installations provision was made originally for only one outlet, which was not adequate. The lighting unit, which was neither decorative nor efficient, was a combination gas and electric wall bracket, 5 ft. 6 in. from the floor. The socket pointed outward at an angle of 45 deg., and a 50-watt clear carbon lamp was surrounded by a crystal shade. The room is very prettily furnished, having a white ceiling, white and light-blue wall paper, white woodwork and furniture decorations in light blue. It was necessary to secure glassware which would harmonize with these colors. The wall bracket was fitted with a 45-deg. socket, a current tap, a 15-watt round-bulb clear tungsten lamp and a cylindrical-shaped diffusing shade. The latter is made of cased glass having an etched design. The base portion is white, the background tinted gray, and four light-blue medallions with a white classic head in the center complete the design. A white silk-covered cord extends from the current tap, by way of the picture molding, to the center of the ceiling. A three-chain ring-type fixture finished in verde and supporting a deep glass bowl, which is equipped with a diffusing shade and a 40-watt clear tungsten-filament lamp, is hung 7 ft. 8 in. from the floor.

The author stated that the kitchen is one of the few rooms in the house where evenly distributed illumination from properly placed lamps is of more importance than appearance. The old equipment was a straight-pipe combination gas and electric fixture, bringing the crystal shade and a 50-watt clear carbon lamp only 6



DOME USED IN DINING ROOM

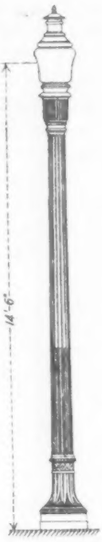
ft. 3 in. from the floor. Shadows were pronounced and the light distribution was very unsatisfactory. This fixture was replaced by a short pipe and chain hanger, a 40-watt clear tungsten lamp and an extensive prismatic reflector, hung 7 ft. 6 in. from the floor. For easy control a ceiling switch was installed. The distribution of light is excellent, but it would have been desirable to have two outlets, using small lamps.

In the cellar one unit is located near a workbench. By using a flat dome-shaped enameled metal reflector with a 40-watt clear tungsten lamp, a wide spread of light has been secured which is adequate for the other parts of the cellar.

Although the total lighting load has been decreased, the revenue to the central station remains the same or even greater. This is more or less of a paradox, but can be demonstrated by a few concrete examples. For instance, the porch now has a 10-watt lamp in place of a 50-watt lamp. When callers are expected this lamp is allowed to remain in service all evening, whereas the larger lamp would be merely turned on and off when a person was entering and leaving. Again, the den is probably the most used room in the house. With the three small lamps in the chandelier, one or two would probably be all that would be used, whereas the indirect fixtures must be turned on in their entirety, thus requiring a load of 100 watts.

Detroit Adding 900 Street Lamps

Nine hundred and fifteen new street and boulevard lighting fixtures, the appropriation for which became available last July, are now being installed in Detroit, Mich., by the local Public Lighting Commission. Of these, 240 4-amp arc lamps, to be fed from underground circuits, will be erected on Gratiot and Michigan Avenues. As a step toward lighting the entire length of Grand Boulevard, a distance of 11 miles, as contemplated by the commission, 100 inverted magnetite-arc lamps are being installed on this boulevard. A section is already equipped with thirty-eight lamps of this type, and as the new lamps will be staggered at intervals of about 159 ft., measured center to center, less than 7 miles remains to be similarly lighted. The type of pole to be used on the boulevard is shown in the accompanying drawing and will be furnished by the George Cutter Company, South Bend, Ind., and the Morris Iron Company, Frederick, Md. These fixtures will also receive energy from underground circuits.



ORNAMENTAL POLE

Five hundred and seventy-five 4-amp lamps will be distributed throughout the city as required and fed from overhead circuits. All of the poles for the 4-amp lamps are being made by the city.

Construction work on the underground conduit runs is completed, and more than half of the cables are already pulled into place. Clay conduits containing from one to twenty-four ducts are employed, according to the locality, so that cables may be replaced or more pulled in without tearing up the streets.

Recent Telephone Patents

Messrs. R. R. Ireland, of East Orange, and S. F. F. Gilson, of Closter, N. J., have jointly patented a hand-telephone set with the transmitter and receiver parts mounted upon a handle. The handle in this set is made of sheet metal, one piece forming the body piece and providing mountings at the two ends for the transmitter and the receiver respectively. The other piece is a box-like cover piece which incloses a terminal plate mounted upon the base piece. This makes the handle of convenient thickness. Through the cover piece an elongated push-button is projected which may be grasped by the hand to operate the switch contact controlling the circuits. A second convenient position is available for flash-signal purposes. This patent is assigned to the Western Electric Company.

A receiver-supporting device is the subject of a patent granted to Mr. H. C. Raiber, of Pittsburgh, Pa. Two head receivers are supported on a bow which in turn is carried on a lug clamped to the stem of a desk-stand set. The bow swings vertically about a horizontal axis on its own plane. A notch in one leg is arranged to press the hook-switch lever down when the bow is elevated to the vertical position.

A selective lock-out system has been invented by Mr. I. F. Manny, of Milwaukee, Wis. This is a step-by-step system operated by a clock train and spring. One novel feature is a magnetic device for rewinding the clock spring. The apparatus has the usual ratchets and pawls, and the selection of any station depends upon the angular displacement of all the sets in synchronous action.

Letters to the Editors

Quick-Firing Arrangement of Boilers to Relay Water-Power

To the Editors of the Electrical World:

SIRS:—Referring to the article with the above title in your issue of Dec. 6, it would seem that some of the expense and complication of installing the heating coil in the blow-off tank might be eliminated.

From Fig. 5 it will be seen that large piping has been connected between the blow-off tank and the boiler drum, and that after the steam from the main steam header has passed through the heating coil in the blow-off tank it then passes into the drum connection. Since the water in the blow-off tank receives the total heat of the steam by mingling with it, the heating coil seems unnecessary. The desired result could be obtained more readily by directly connecting the live-steam connection into the bottom of rear header or mud drum of boiler. The difficulty encountered in preparing a fire on the chain grate might well be obviated by installing auxiliary oil burners for use in bringing the boiler up to temperature quickly, and the cost of installing the burners is comparatively low. Where fuel oil can be obtained one should not overlook the aid in emergency fire control which oil burning allows. The disadvantage that arises from injury to the setting by quick firing is much lessened by maintaining hot water in the boiler as above mentioned and keeping the boiler dampers and doors closed until the fire is ready to be started.

Columbus, Ohio. B. W. DENNIS.

Public Service Corporations and the Public

To the Editors of the Electrical World:

SIRS:—In your issue of Jan. 3, 1914, I note with interest the article of Mr. Alton S. Miller upon the subject of "Public Service Corporations and the Public," in which it is said that the existing antagonism on the part of the public toward the public service corporation is largely the result of the ignorance of the public with regard to the corporation, its investments, its policies, its obligations and the service it is rendering.

The author states that in a number of places in the country there is complete understanding between the public utilities company and the people, and that in such places the corporation is favorably recognized by the community which it serves.

Mr. Miller advocates acquainting the public with the problems of the companies and says: "Such a general educational movement should be started through the associations representing the principal public service activities. After the details are worked out a concerted movement should be begun all over the United States to enlighten the public, and thereby secure its effectual co-operation. . . . It is suggested that such a plan is Utopian, and the answer is that it has been followed in many places and has produced the desired results."

Apparently Mr. Miller is unaware of the fact that the Society for Electrical Development is intended to do just this work. As Mr. Miller says, "Though the companies may have been more than fair in the treatment of their customers, their duty does not end there. The public must be informed of all the facts and thereby convinced that the company is fair."

If the public service corporations of this country wish to take the excellent advice of Mr. Miller, they can have

just such educational work done for them by becoming members of the Society for Electrical Development.

J. M. WAKEMAN,
General Manager
Society for Electrical Development.

New York, N. Y.

The Ampere-Hour Meter and the Storage Battery

To the Editors of the Electrical World:

SIRS:—Five years ago the ampere-hour meter as a commercial measuring instrument was practically unknown in the United States. Mercury and other motor type ampere-hour meters, as well as electrolytic meters, had been used abroad for a number of years, principally as house-service meters, but these types had found no favor in the United States owing to the feeling which has always existed that only an energy-recording meter should be used for such service. Some attempt had been made in the early part of this century to use ampere-hour meters in connection with certain large central-station batteries, but the meters themselves were very faulty and these attempts were stopped until 1908.

At that time Mr. Ernest Lunn, then chief engineer of batteries of the Commonwealth Edison Company, Chicago, suggested to the writer that ampere-hour meters would be a desirable adjunct for use with central-station batteries and also with batteries on electric vehicles and in train lighting. As a result of this suggestion the Sangamo Electric Company developed and in the latter part of 1908 brought out a few ampere-hour meters which were used by the Commonwealth Edison Company both with stand-by batteries and on electric trucks. The results were so satisfactory that regular production of ampere-hour meters was begun by that company in 1909, these being the first successful motor-type ampere-hour meters manufactured in the United States.

Great difficulty was experienced at that time in convincing engineers, storage-battery manufacturers, electric-vehicle people and railway men of the necessity or even desirability of an ampere-hour meter, and one prominent railway electrical engineer remarked that while the ampere-hour meter appeared to be a very pretty mechanical device, his company was getting very satisfactory results with its batteries and he couldn't see any use spending money for such meters. To-day that same man is the most enthusiastic advocate of the use of ampere-hour meters with every system of railway-train lighting, and when he became converted about two years ago he inaugurated the use of these meters on every electric-lighted car of the great railway system with which he is connected.

A prominent electric-vehicle engineer stated that the meter might be very good for stationary-battery service or in railway train-lighting service but that the volt-ammeter was the only thing for use on an electric vehicle and that people could not understand or use an ampere-hour meter. He even went so far as to maintain that it was reasonable to expect a lady to get out of her car and use a hydrometer in order to ascertain the condition of the battery on the car. The company with which that man was connected is to-day using a distant dial ampere-hour meter on every car it produces, and the volt-ammeter is forgotten.

Another large storage-battery company, which tried one of the first ampere-hour meters in 1909, said that it looked like a good device but was not necessary. To-day every piece of literature this company sends out dealing with the care and operation of batteries mentions the desirability and great value of the ampere-hour meter.

During the summer of 1909, shortly after the ampere-hour meters were brought out, effort was made to prove to the Navy Department of the United States government the value of these meters in connection with storage batteries used for propulsion of submarines when running submerged. Apparently their value could not be seen at that time, but every submarine built for the United States government in the last year or two has as standard equipment ampere-hour meters for the main recording and indicating devices on the storage batteries.

Many other such examples might be cited but this is hardly necessary as the whole trend of the present day is toward the use of the ampere-hour meter—the instrument which indicates the true condition of a battery with respect to charge.

R. C. LANPHIER,
Secretary and General Manager
Sangamo Electric Company.

Springfield, Ill.

Conflicting Dates of Society Meetings

To the Editors of the Electrical World:

SIRS:—The article on "Preventing Conflicts in Dates of Societies' Meetings" in your issue of Dec. 20 deserves attention particularly with reference to the assignment of dates for the conventions of public utility associations.

Some of these associations are able to hold their conventions or annual meetings at almost any time of the year without inconvenience to themselves or their members, while others are limited by local or sectional conditions to a very narrow range of dates. Owing to certain local conditions of business and the location of meeting points, the Southwestern Electrical & Gas Association, for example, is virtually compelled to hold its conventions during the latter part of April or the first part of May, and in doing so it has found for the last two or three years that these dates often conflict with those of other public utility organizations. In 1912, for example, the Natural Gas Association met on almost the same dates as the Southwestern association, while the National Electric Light Association met the week afterward. Not only was the Southwestern association thus deprived of some of its best gas members, but also of some of its best electrical men, for with the close proximity of the N. E. L. A. date and that of our convention it would have been too much to ask managers or heads of departments to absent themselves from business for two weeks consecutively.

This letter is therefore written to suggest that the secretaries of public utility or engineering organizations form some central bureau where matters of meeting dates can be arranged by timely correspondence, at least, so that the dates for these periodical meetings may not conflict and rob one or the other of the organizations of the attendance it would receive if these dates did not conflict.

Besides affecting the active members of the organizations, this matter of conflicting convention dates very vitally interests supply men who attend and make exhibits at these conventions or annual meetings. I personally know of instances where such a conflict last year nearly tripled the attendance and exhibition expenses of one electrical supply concern, and the same thing is probably true of many others.

It will cost very little to attempt by correspondence the proper adjustment of conflicting dates during the coming year, and the writer will be glad to do anything to expedite the result desired.

H. S. COOPER,
Secretary
Southwestern Electrical & Gas Association.

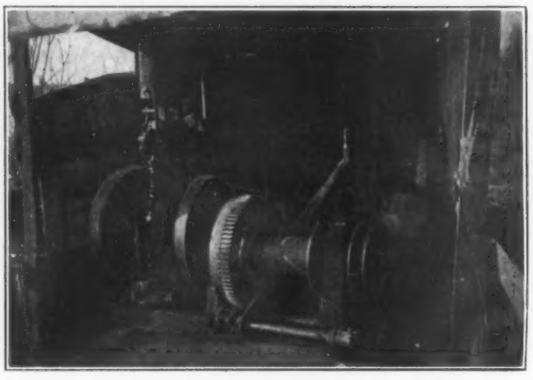
Dallas, Tex.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Motor-Driven Gas-Engine Haulage Outfit

At the site of the power house now being erected on the Rock River, near Sterling, Ill., gas engines were formerly employed to haul the carts bearing rock blasted from the wheelpits and tailrace up a steep incline of the river bank. To eliminate, however, the



GAS ENGINE DISPLACED BY MOTOR

starting troubles experienced on cold mornings, use is now made of electric motors supplied with energy from the circuits of the Illinois Northern Utilities Company to drive the haulage apparatus. The accompanying illustration shows the rather unusual method employed for retaining the winding drum and gasoline engine on its foundation after the electric motors had been placed in operation. The piston and connecting rod were removed from the engine and a belt was run over the flywheel to the pulley on the motor.

During the working periods of the day the motor is operated continuously, and when a cart full of rock is ready to be hauled up the grade the operator moves the lever shown in the illustration, meshing the gears and pulling the load upon the motors. The gasoline engine is thus now doing duty simply as a flywheel.

30,000-Ton Subaqueous Coal Bunker, Kansas City, Mo.

During December the submerged coal bunker at the Metropolitan plant of the Kansas City (Mo.) Railway & Light Company was filled for the first time. The bunker measures 340 ft. in length and 82 ft. wide throughout the most of its length and has a capacity of 30,000 tons of coal when its contents are heaped above the water line. The plan of the bunker, showing the relative location of the power house forming one side of the pit and the railroad tracks from which the coal is delivered, is reproduced herewith.

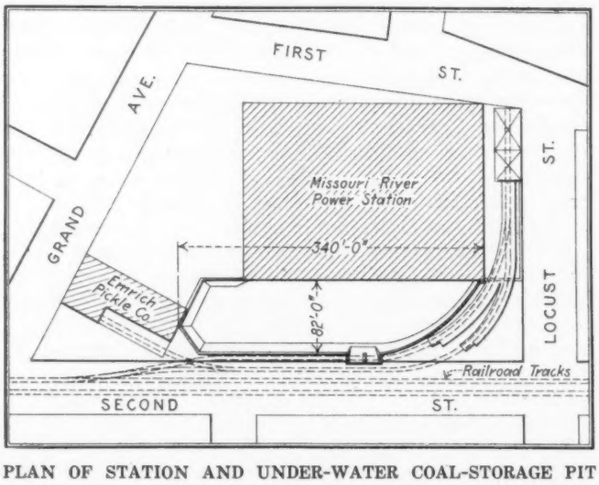
Construction methods employed in excavating the pit were unique and perhaps even more interesting than the project itself. At the site of the present pit a mound of clay and soft earth formerly stood by the side of the station. To remove this small hill and to make an excavation of proper depth a turbine-driven boiler-feed pump supplying water at 200-lb. pressure was connected to a pipe line leading from the boiler room to the site of the bunker. By playing a heavy stream of water from this pipe line onto the soft earth, the soil was loosened and washed beneath the power house, through a drain under First Street, and ultimately down to the Missouri River, about ½ mile distant. Warm waste circulating water which would otherwise have been diverted to the drain was used to feed the hydraulic excavating outfit, so that there was no great increased demand on the water system of the plant.

With the work of excavation completed, the walls and bottom of the bunker were then built up of concrete reinforced with 0.75-in twisted steel rods. Heavy concrete buttresses were placed in the interior along the south wall of the pit to withstand the strain imposed by the movement of heavy trains along the tracks at that side of the bunker, the tracks being on a level with the top of the concrete wall.

Motor-Driven Pumps for Moving Coal About the Pit

For conveying coal from one part of the pit to another and for loading the belt conveyors carrying the supply to the bucket conveyor system of the plant two motor-driven Worthington pumps have been installed. Each pump is capable of moving 1 cu. yd., or about 1300 lb., of coal per minute. Both pumps are belt-driven from a single 100-hp motor placed upon a concrete-pillar foundation above the water line in the pit.

In freezing weather, when it becomes impossible to move the coal by means of the pumps, a 2-cu. yd. dragline bucket will be placed in service. By this arrangement the coal will be carried to a crusher where both coal and ice will be ground into pieces small enough to be conveniently handled by the conveyor systems.



PLAN OF STATION AND UNDER-WATER COAL-STORAGE PIT

Mr. Charles E. Fritts, electrical engineer of the Metropolitan Street Railway Company, Kansas City, Mo., designed and superintended the building of this coal bunker.

Operating Data on Battery-Driven Tractor

Some data are given in the accompanying table on the daily performance, cost of maintenance and operation, etc., of the battery-driven tractor used by the Pennsylvania Railroad for hauling freight cars through the streets of Jersey City, N. J. This tractor, which was described on page 727 of the *Electrical World* of April 5, 1913, was placed in regular service on Feb, 4, 1913, and during the seven months which followed

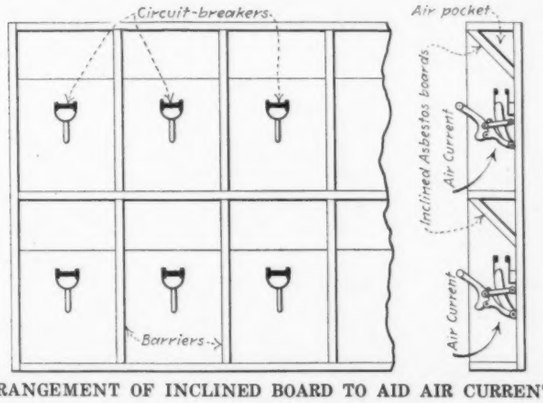
OPERATING DATA, BATTERY-DRIVEN TRACTOR

Cost of maintenance and operation, seven months	$3510.21
Interest at 6 per cent on $13,400, seven months	476.00
Depreciation on $13,400 (less tires and battery, $4,200, equals $9,200), at 5 per cent, seven months	268.33
Depreciation on battery, $3,200 at 20 per cent, for seven months	373.34
Total charges for seven months	$4627.88
Total charges if horses had been used (4935 cars × $1.86)	9179.10
Saving by electric tractor, seven months	$4551.22
Saving over investment by electric tractor, per cent	58.5
Saving including investment (58.5 + 6 per cent), per cent	64.5
Cost of service per car ($4,627.88 ÷ 4935)	0.938
Cost of service per ton ($4,627.88 ÷ 165,524)	0.028
Average number of cars per mile	2.4
Cost of service per ton mile (0.028 × 2.4)	0.067
Total number of cars handled (4935 + 2788)	7723
Number tons handled per hour	121
Cost of service by electric tractor per working day	$27.87
Cost of service by team per working day	$55.29

hauled 4935 cars, having a total weight of 165,574 tons, a distance of 2076 miles. The cost of handling these cars with the electric tractor was $4,672.88, as compared with $9,179.10 had horses been employed, thus representing a return of 64.5 per cent on the capital invested in the tractor. The figures in the accompanying table include the cost of all repairs made on the equipment.

Helping the Air Currents to Extinguish Arcs

When circuit-breakers are mounted in tiers and separated from each other by horizontal barriers it frequently happens that if the switch opens under load the arc occurring at the contacts will linger longer than when the breaker is not surrounded by partitions.



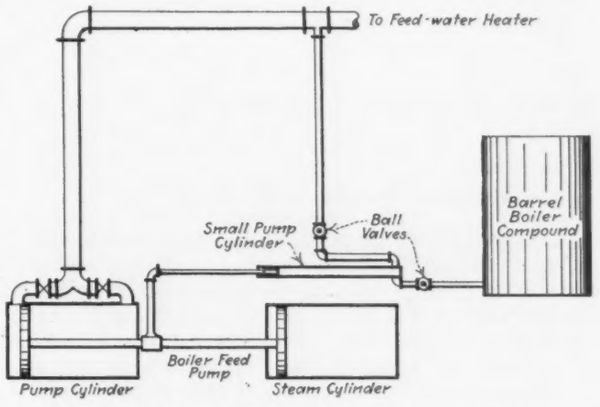
ARRANGEMENT OF INCLINED BOARD TO AID AIR CURRENTS

This phenomenon is probably caused by the division walls obstructing the air currents which usually extinguish the arc at a breaker mounted in the open.

A simple method of overcoming this objection to barriers between circuit-breakers is shown diagrammatically herewith. By fastening asbestos boards below the horizontal barriers in an inclined position so as to cover the air pocket above each breaker, the air currents caused by the heat of the arc are assisted in their normal upward flow. This scheme is being tried in the Oneida Street generating station of the Milwaukee (Wis.) Electric Railway & Light Company.

Pump for Apportioning Boiler Compound and Feed Water

In one of the steam plants of the Illinois Northern Utilities Company, on the banks of the Rock River at Sterling, Ill., a small pump cylinder has been attached to the boiler-feed pump in such a manner that at every



PUMP FOR APPORTIONING BOILER COMPOUND

second stroke a predetermined amount of boiler compound is added to the feed water. As shown in the accompanying diagram, the cylinder of the small compound pump is held stationary while its plunger moves with the piston rod of the boiler-feed pump. Thus at alternate strokes of the latter the proper amount of compound is injected into the main carrying the feed water to the heater. Ball valves placed in the piping prevent a reversal of flow in the compound pipe line. Mr. A. W. Bush, superintendent of the Sterling company, says that the only attention needed by the apparatus is an occasional vigorous stirring of the boiler compound in the barrel. This detail is attended to by the boiler-room force.

Electric Water Heater for Car-Washing Service

In installing an electric water heater for washing its cars, the Cincinnati Traction Company was prevented from using the customary forms of heaters for the following reasons: First, hot water was desired throughout the year and therefore could not be furnished by the steam-heating plant. Second, car washing was done in one end of the paint-shop bay, so that a coal heater could not be employed unless it was installed at some outside point. Third, it was desirable to have hot water under pressure, which could not be obtained continuously with an ordinary coal-type hot-water heater.

Confronted by these limitations, a home-made electric water heater was therefore designed and installed. Although the cost of heating water electrically is more expensive than by other methods, it has met all the requirements, and the energy actually used is so small as to make the cost not prohibitive. For all practical purposes this home-made water heater is instantaneous. It consists of a box 8 ft. long by 2 ft. square in section, built of 1.25-in. yellow pine. The box is lined with

0.25-in. transite board to insulate the wood from the heater coils. Eight 17-amp electric coil heaters are installed on the bottom and sides of the box and arranged in two circuits. These are sufficient to maintain a temperature of 210 deg. in the box. The heater coils in the bottom of the box serve as supports for the 1-in. wrought-iron pipe coils, which are arranged in a rack four coils high and six coils wide. These pipes are placed in a continuous coil connected with the city water supply at one end and to a hose connection at the other. When the two water taps provided at each end of the coil are open cold water flows through the pipe coils, which are built up with return bends. The temperature maintained in the box by the electric heaters is sufficient to raise the water nearly to the boiling point before it reaches the hose connection. In actual service this heater has been found of ample size to supply four scrubbers with hot water continuously during a sixteen-hour day. Energy for the heaters is supplied from the 550-volt trolley wire through a knife switch.

Electrically Controlled Prony Brake

A single prony brake when used to absorb energy from a rotating flywheel will not ordinarily maintain a constant engine speed even when frequently adjusted by hand. This is due largely to the change in the coefficient of friction between the flywheel and the brakeshoe caused by heating, presence of oil and by varying conditions of lubrication. An electrically controlled dynamometer which will automatically maintain a constant engine speed, even under the conditions mentioned above, was described by Mr. Nathan C. Johnson, New York City, at the annual meeting of the Society of Automobile Engineers recently held in New York City.

The principle of this modified prony brake is shown in Fig. 1. Instead of manually adjusting the grip of the brake band, the latter is automatically controlled by an electromagnet which acts through a toggle joint. The exciting current for this magnet is furnished by a small magneto belted to the engine shaft. If the engine speeds up slightly the magneto drives more current

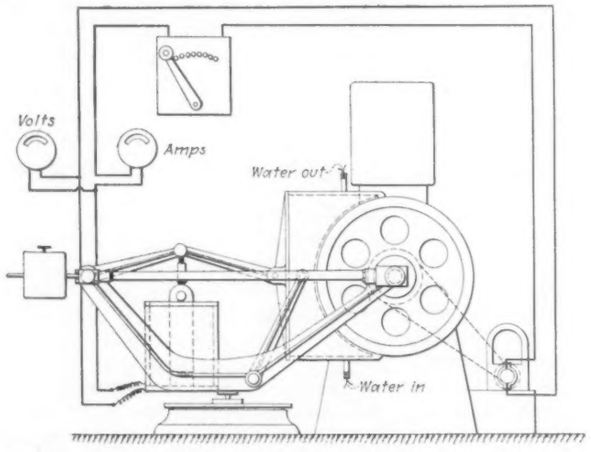


FIG. 1—ELECTRICALLY CONTROLLED PRONY BRAKE WITH SOLID SHOE

through the electromagnet, thereby increasing the pressure on the brake band and restoring the engine speed to normal. The brake arm rests on a knife edge on the scale platform and a counterweight overcomes the tendency of the brakeshoe to fall inwardly against the flywheel. The thrust of the brakeshoe caused by friction with the flywheel is transmitted in a direct line to the knife edge by a compression member. No strains are caused in the engine shaft by using this brake as the thrust of the shoe is taken up entirely by bearings on each side of the flywheel.

In the circuit between the magneto and electromagnet are an adjustable resistance and a wattmeter or a voltmeter and ammeter. By varying the resistance the

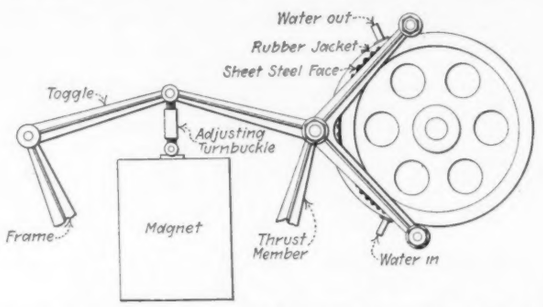


FIG. 2—FLEXIBLE PRONY BRAKESHOE ADAPTABLE TO ELECTRICAL CONTROL

brake load can be changed and read on the scale beam as usual. The volt-ampere readings, or watts, and the internal losses in the magneto should be added to the brake readings to obtain the total power developed by the engine.

Experiments conducted at Cornell University with this apparatus have shown that there is no perceptible variation in the speed or load. If the brakeshoe is made flexible, as shown in Fig. 2, it will fit flywheels of different diameters, and the heat caused by friction will be radiated faster than if a solid shoe is used. By placing two water-cooled shoes on opposite sides of the flywheel the radiating surface can be still further increased.

Cost of Producing Power with Different Oils

As the relative prices of different grades of oil vary in different localities, it is convenient to have a simple method for comparing the cost of operating an internal-combustion engine on various grades of fuel. The method described herewith makes use of the principle that 1 lb. of almost any petroleum oil contains approximately 19,000-lb.-Fahr. heat units.

UNITED STATES PETROLEUM STANDARD BAUMÉ (60 DEG.)

Baumé	Specific Gravity	Baumé	Specific Gravity
10.0	1.000	30.0	0.876
16.0	0.959	32.0	0.865
18.0	0.947	34.0	0.855
20.0	0.934	36.0	0.845
22.0	0.922	38.0	0.835
24.0	0.910	40.0	0.825
26.0	0.898	42.0	0.816
28.0	0.887	44.0	0.806

The specific gravity of the oil can, of course, be measured, and the manufacturer of the engine will furnish figures on the consumption per brake-hp-hour. With these data, to compare costs multiply the specific gravity of the oil in question by 8.33 (weight of 1 gal. of liquid having specific gravity of 1.00), which gives the weight per gallon. Divide this product by the guaranteed oil consumption per brake-hp-hour expressed in pounds, and the result will be the brake-hp-hour obtainable with 1 gal. of the specific oil. The cost of oil

per brake-hp-hour may then be found by dividing the price of oil per gallon by the last result.

By substituting values for the letters in either of the accompanying formulas the same result may be obtained quickly by slide-rule operation:

$$\frac{p \times c}{sp.\ g. \times 8.33} = \frac{0.12 \times p \times c}{sp.\ g.}$$

= cost of oil per brake-hp-hour in cents,

where

p = price of oil per gallon in cents

c = guaranteed oil consumption in pounds per brake-hp-hour

$sp.\ g.$ = specific gravity.

Thus, by knowing the unit price and specific gravity of various oils suitable for the engine used, it is possible to determine the particular one which will afford the most economical results.

An example is given below comparing the costs of oil when two different grades are considered.

Fuel oil: $p = 2.75$; $sp.\ g. = 0.91$.

Kerosene: $p = 7.5$; $sp.\ g. = 0.816$.

$c = 0.6$.

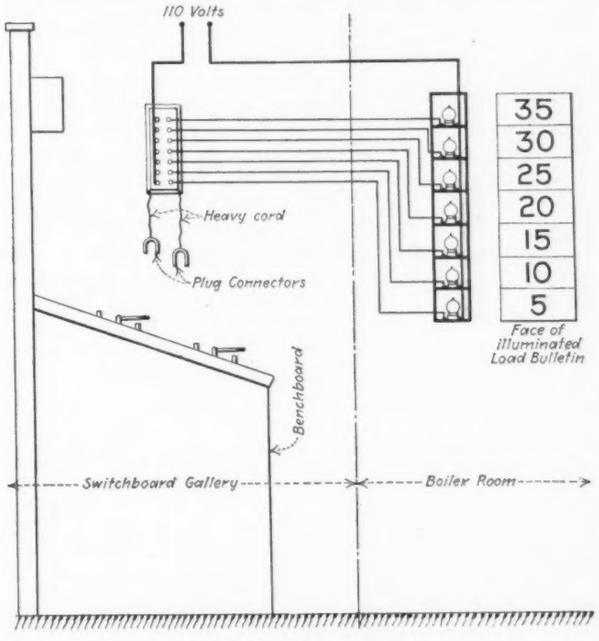
$$\frac{0.12 \times 2.75 \times 0.6}{0.91} = 0.22 \text{ cent per brake-hp.}$$

$$\frac{0.12 \times 7.5 \times 0.6}{0.816} = 0.66 \text{ cent per brake-hp.}$$

When the density of the oil is expressed in degrees Baumé the accompanying table of equivalents may be used for translating values of specific gravity.

Visual Load Indicator for Boiler Room

In a combination railway and electric-lighting plant in the Middle West the station engineer has devised a



VISUAL LOAD INDICATOR

scheme for showing the boiler-room force the load on the station at the moment, without the necessity of consulting the face of a small instrument. As shown in the accompanying illustration, the device consists of groups of lamps mounted behind a series of figures on a glass case. The main portion of the glass is painted red and the figures are in white. These lamps are connected through a plug board to a 110-volt circuit in such a manner that the switchboard operator, reading the station load from the totaling instrument, can connect the proper lamps to the energizing circuit so that the load indicator will show in "thousand kw" the output of the turbines and engines at that time. When the load is fluctuating rapidly two plugs are used, illuminating two of the section figures and indicating the limits between which the variations are ranging. As indicated from the sketch, the illuminated load bulletin is mounted out of way of the men in the boiler room while the plug connectors are placed near the end of the benchboard on the switchboard gallery.

Emf Delivered by Induction Coil

If interrupted direct current is allowed to flow through the primary winding of an induction coil, will the induced emf in the secondary be uni-directional or alternating? Please advise me whether the relation of the secondary and primary emfs depends entirely on the ratio of turns in their respective coils. H. S.

When a direct current is introduced into the primary winding of an induction coil there is produced a certain mmf which results in a flux in the core of the induction coil. The variation in this flux produces in the secondary coil an emf the value of which depends upon the rate of variation in the flux and not upon the value of the flux. The secondary emf is therefore high when the current is first introduced into the coil, reduces to zero as the current becomes steady, and then reverses when the current is removed from the primary coil. The secondary emf is therefore not uni-directional. The current in the secondary coil depends on the impedance of the total secondary circuit, including that of the arc when one forms. If the secondary circuit is open there will, of course, be no current whatsoever. Under any chosen condition of operation the actual value of the secondary emf varies directly with the number of secondary turns.

Break in Motor-Field Circuit Opens Circuit-Breaker

In our machine shop there is a shunt motor which drives all of the shop equipment. When starting this motor I place the speed-controller handle on low speed and bring the starting handle up to running position without any trouble. On turning the speed-controller handle to the contact which ought to give the required speed, however, the circuit-breaker invariably opens. When none of the shop machines is connected to the motor the same operation fails to open the breaker, but instead the motor speed increases to almost double its normal value. Will you please explain the reason for this trouble? B. K. G.

From your description the fault appears to be in the speed-control switch which regulates the shunt-field excitation. Possibly the switch contact which is used to give the desired speed is burned off so that it does not touch the controller handle, or it may be that the wire connecting this button with the resistance coils inside is severed. In either case the shunt-field circuit would be opened when the handle reached that particular contact. With no field flux except its own residual magnetization and with potential impressed across the armature brushes, the motor armature will receive a greatly increased current and will tend to speed up abnormally until the counter emf is practically equal to the voltage. When the speed is low and the acceleration retarded by a load on the motor, the armature draws considerably more than its normal full-load current, thereby opening the circuit-breaker. When unloaded the motor speed is higher and the acceleration more rapid; the current taken is smaller, but the speed rises to the abnormal rate you observed.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Lamps and Lighting

Radiation of the Carbon Lamp.—LUMMER.—A paper read before the German Illuminating Engineering Society. The author shows that from the experimental determination of the true temperatures of the carbon filament at different loads it is possible to determine the law of the total radiation of carbon filaments. It is found that carbon radiates as a "gray body"—that is, less than a "black body"—but for each wave-length by the same amount less for all temperatures. The total

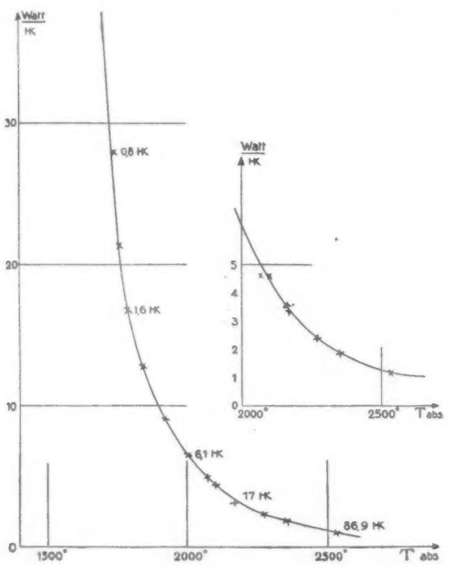


FIG. 1—RELATION BETWEEN WATTS PER HEFNER CANDLE AND ABSOLUTE EMPERATURE

radiation from a carbon filament is $0.725 \times 10^{-12} \times T^4$ gram calories per sq. cm per second, where T is the absolute temperature. The relation between watts per hefner candle and absolute temperature is shown in Fig. 1, from which the following figures are taken:

Watts per Cp.	Temperature, Deg. Abs.
5.2	2057
4.8	2079
4.4	2100
4.0	2123
3.6	2150
3.2	2182

Hence if the temperature of the carbon filament is increased from 2100 deg. to 2182 deg.—that is, by only 82 deg.—the power taken per cp is reduced from 4.4 watts to 3.2 watts.—*Zeit. f. Beleucht.*, Dec. 20, 1913.

Generators, Motors and Transformers

Hunt Cascade Induction Motor.—F. M. DENTON.—A long article profusely illustrated by diagrams explaining the method of operation and arrangement of the windings of the Hunt cascade induction motor, which has a single winding on the stator as on the rotor.—London *Electrician*, Jan. 2, 1914.

Magnetic Fields.—L. BARBILLION.—The conclusion of his mathematical paper illustrated by diagrams on magnetic fields of various forms and the electromotive forces induced by them. In the present instalment the author gives a comparison of a single-phase alternating field with a rotary field and then discusses the calculation of the "reduction coefficients" of the fluxes and induced emfs with respect to their theoretical values.—*La Lumière Elec.*, Dec. 27, 1913.

International Standardization of Electrical Machinery.—An account of the extended discussion which followed Mr. Everest's paper at Birmingham and in which Messrs. C. Le Maistre, C. C. Garrard, T. F. Wall, G. Kapp, H. R. Hudson, C. T. Siebs, N. B. Rosher, W. J. Larke, M. Kahn and H. M. Hobart participated.—London *Electrician*, Jan. 2, 1914.

Generation, Transmission and Distribution

Protection of Transmission Lines by Ground Wires.—W. PETERSEN.—The value of ground wires as protection for transmission lines cannot be judged completely by theory because their protection against direct lightning flashes is outside of the realm of calculation. On the other hand, their behavior in the case of sudden variations of the earth's field (lightning flashes in the neighborhood) can be calculated just like the charging currents of a transmission line. The ground wire diminishes the charge caused by the earth field on the protected line. Further, it increases the capacity of the line against the earth. Since the voltage which the line assumes when the field breaks down is proportionate to the ratio of charge to capacity against earth, and since the charge is decreased and the capacity increased, the voltage produced on the transmission line is very much smaller than it would be if the line were not protected. A simple three-phase line for 20,000 volts can be protected by a ground wire so that the dangerous rises of voltage will be 40 per cent less than they would be without the ground wire. The energy set free is 55 per cent less. Other cases are also calculated. The author thinks that ground wires are the most important of all protective devices for overhead transmission lines. Transmission lines with well-insulated transformers and well-designed insulators are well protected by a ground wire. The dimensions of the ground wire do not have any effect on its protective action so that they should be chosen from considerations of mechanical strength.—*Elek. Zeit.*, Jan. 1, 1914.

Norwegian Water-Power Plant.—A fully illustrated description of the Rjukan water-power plant which supplies power to the nitrate works. The power plant contains ten turbines each of 15,700-hp rating, coupled to 17,000-kva, 10,000-volt to 11,000-volt alternators.—London *Elec. Review*, Jan. 2, 1914.

Handling Raw Materials at the Blast Furnace.—J. E. JOHNSON, JR.—A long and profusely illustrated article describing the methods of handling on a large scale raw materials at the iron blast furnace. At the present time

no power is considered under any ordinary conditions except electricity, the supply being either from trolley wires or a third-rail. In the large majority of cases direct-current at 220 volts is used.—*Metall. and Chem. Eng'ing*, January, 1914.

French Transmission System.—A. SCHOEN AND M. CHARLET.—The first part of a profusely illustrated description of the transmission system of the electric company of Franche-Comté, which supplies energy to the cities of Besançon, Aranthon, Moulin du Pré, Montrambert, Auxonne and the surrounding country.—*La Lumière Elec.*, Dec. 27, 1913.

Installations, Systems and Appliances

Reinforced Concrete Affected by Electricity.—KURT LUBOWSKY.—An illustrated article in which the author investigates the effects of electric currents and discharges on reinforced concrete. He concludes that for installations which have been made properly there is no danger. Earth currents may be neglected in their effect on reinforced-concrete buildings, but must be taken into consideration with bridge structures. Tests are described which show the justification of the earthing regulations for reinforced-concrete poles for transmission lines. The article is to be concluded.—*Elek. Zeit.*, Jan. 1, 1914.

Electric Equipment of British Post Offices.—H. C. GUNTON.—A long, illustrated abstract of a paper read before the British Institution of Electrical Engineers. For lighting and power service in the London post offices there is now one generating station with three substations. Figures are given on the use of electricity for motor purposes, especially for electric elevators (in comparison with hydraulic elevators) and for electric lighting. An electric railway is to be erected for purely postal purposes between two districts in London.—London *Electrician*, Dec. 26, 1913.

Wires, Wiring and Conduits

Resistivity of Copper from 20 Deg. C. to 1450 Deg. C.—E. F. NORTHRUP.—An account of an extended and very careful investigation of the change of the electric resistivity of copper in the temperature range from 20 deg. C. to 1450 deg. C. The general arrangement of the tests and the electric furnace employed are described. Tests were made with rising as well as falling temperature. The results are given in tables and diagrams. The chief results are summed up in the accompanying table for copper of 99.39 per cent conductivity.—*Jour. Franklin Inst.*, January, 1914.

VALUES FOUND FOR COPPER OF 99.39 PER CENT CONDUCTIVITY

Temperature, Deg. C.	Resistivity, Microhms per Cm. Cube	Ratios ρ_t/ρ_{t_1}	Remarks
20	1.7347		
1000	9.42	$\rho_{1000}/\rho_{20}=5.429$	Metal solid.
1082.6	10.20		
1082.6	21.30	$\frac{\rho_m}{\rho_s}=2.088$	Metal molten.
1100	21.43		
1340	23.39		
1450	24.22	$\rho_{1450}/\rho_{20}=13.96$	Highest measurement was 1443 deg. C.

Elasticity of Copper Wire and Passage of a Current.—H. L. DODGE.—An account of determinations of Young's modulus of a specimen of copper wire at various temperatures between 20 deg. C. and 150 deg. C. with the object of ascertaining whether or not heating by an electric current has any effect other than that caused by the accompanying increase of temperature. Some of the results are as follows: A copper wire can be brought to a steady elastic state in which the stretch modulus becomes a function of temperature. In the present instance it was brought about by repeated stretching and by heating and cooling over a range of temperature of 20 deg. C. to 150 deg. C. Heating by an electric current has no effect other than that caused by the accompanying temperature. Young's modulus of a copper wire decreases with increase of temperature at an increasing rate. Heating and repeated stretching increases Young's modulus.—*Phys. Review*, December, 1913.

British Wiring Rules.—F. BROADBENT.—An article illustrated by diagrams pointing out that there is still a great lack of appreciation on the part of manufacturers and contractors of the conditions to be fulfilled in factory work in order to comply fully with the British Home Office requirements. This makes it exceedingly difficult for those whose business it is to plan and supervise such work to insure that the conditions are fulfilled without their being stigmatized as faddists or cranks.—London *Elec. Review*, Jan. 2. 1914.

Switchboard Rules.—A summary of the new switchboard rules of the German Association of Electrical Engineers with a comparison with the rules of other associations.—London *Elec. Review*, Jan. 2, 1914.

Oil Switches.—W. J. P. ORTON.—A sketch of the evolution of modern oil switches.—London *Elec. Review*, Jan. 2, 1914.

Electrophysics and Magnetism

Thermionic Currents.—IRVING LANGMUIR.—An account of an experimental research on the effect of space charge and residual gases on thermionic currents in high vacuum. The work indicates that the experimental conditions that have commonly been employed in the investigation of thermionic currents in vacuo have not been well adapted to eliminate important secondary effects. Proper conditions are an extremely high vacuum and the avoidance of large anodes. Contrary to the ordinary opinion, the general effect of very low pressures of gas is greatly to reduce the electron emission from an incandescent metal. This effect is especially marked at low temperatures. In most cases it probably disappears at very high temperatures. The normal thermionic current from tungsten in a "perfect" vacuum follows Richardson's equation accurately. Preliminary data are given for the electron emission from tantalum, molybdenum, platinum and carbon. The effect of the presence of other gases was also studied.—*Phys. Review*, December, 1913.

Equations of Electrodynamics.—H. R. HASSE.—A mathematical paper in which the author shows that it is not possible to deduce a unique system of electrodynamical equations for matter in motion by means of the principle of relativity, the corresponding equations for matter at rest being assumed to be known. In other words, the knowledge of the electrodynamical equations for matter at rest, which we may deduce from experimental evidence and not necessarily from any theory of the constitution of matter, together with the principle of relativity, is not sufficient for the deduction of the equations of electrodynamics for matter in motion. The author shows, however, how the principles of relativity, in combination with certain other conceptions, may be used to complete the scheme of electrodynamical equations.—*Philos. Mag.*, January, 1914.

Heating Effects at the Anode in Vacuum Tubes.—B. HODGSON.—The author found formerly that the energy communicated to the anode during discharge in air was approximately proportional to the current through the tube. In the present paper he presents the results of an investigation on the relation between current, gas

pressure and energy given to the anode in oxygen, and, further, on the relation between the energy communicated to either electrode and the corresponding distance. The mechanism of discharge is also discussed. —*Philos. Mag.*, January, 1914.

Gamma Rays of Polonium, Radium and Radio-Actinium.—A. S. Russell and J. Chadwick.—A paper in which methods of separating radium D, radium E and polonium in the pure state in a form suitable for physical work are described in detail. The gamma radiations from polonium, from radium and from radio-actinium were investigated. Polonium emits gamma radiation of one type only. The radiation is due to the polonium itself and is not due to impact of the alpha rays of polonium against the metal on which it is deposited. The alpha rays of polonium are able to excite a soft gamma radiation in copper, though not to an appreciable extent in platinum or in lead. A very small quantity of beta radiation is also emitted by polonium. Radium itself freed from its products emits gamma rays. This gamma radiation consists of three types, one of which is much softer than the other two. The quantity of polonium separated from two different quantities of old radium of known age was about one-half or one-third of that which could be expected if the separation were approximately quantitative and the period of radium *D* were sixteen and one-half years. Radio-actinium emits two types of gamma rays.—*Philos. Mag.*, Jan. 9, 1914.

Delta Rays from Gases.—Norman Campbell.—A paper in which there is considered the theory of the conduction occurring through an ionized gas when the pressure of the gas is so low that the free path of an electron is not small compared with the distance between the electrodes and the number of ions made in the gas is not large compared with the number of delta rays made at the electrodes. The discussion is based mainly on the recent work of Franck and Hertz on the collisions between electrons and atoms. The results of some measurements published previously are also considered in the light of the theory. They seem in general accordance with that work. They cannot be explained quantitatively at present, but it appears that they make it necessary to believe that delta rays are emitted from ionized molecules of gases with velocities of the same order of magnitude as those from metals.—*Philos. Mag.*, Jan. 1, 1914.

Magnetic Susceptibility of Gases.—W. P. Roop.—An article in which a new method for determining gas susceptibility is developed which far exceeds previous methods in sensitiveness. An illustrative set of data taken with air and CO_2 leads to the value for oxygen of 0.144×10^{-6}—*Phys. Review*, December, 1913.

Units, Measurements and Instruments

Roentgen-Ray Tube.—W. D. Coolidge.—An illustrated description of a powerful Roentgen-ray tube with a pure electron discharge. As compared with tubes of the ordinary type, the new tube has the following special features: The pressure, instead of being a few microns, is as low as it has been possible to make it, that is, not more than a few hundredths of a micron. The cathode consists of a body which can be electrically heated (such as a tungsten or tantalum filament) and, suitably located with reference to that portion, a ring or cylinder consisting preferably of molybdenum or tungsten or other refractory metal. The ring or cylinder is connected either to the heated portion of the cathode or to an external source of current by means of which its potential may be brought to any desired value with respect to the heated portion. The heated portion of the cathode serves as the source of electrons, while the ring or cylinder assists in so shaping the electrical field in the neighborhood of the cathode that the desired degree of focusing of the cathode-ray stream upon the target shall result. The anti-cathode, or target, functions at the same time as the anode. The operation is satisfactory only when the vacuum is exceedingly high, so high that the ordinary tube would carry no current even on 100,000 volts.

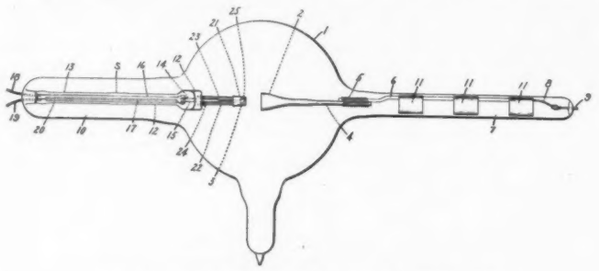


FIG. 2—ROENTGEN-RAY TUBE COMPLETE

Fig. 2 shows the tube complete and Fig. 3 gives details of the cathode and of the front end of the target. In the diagrams, 25 is a tungsten filament in the shape of a flat, closely wound spiral. It is electrically welded to the ends of two heavy molybdenum wires 14 and 15, to the other extremities of which are welded the two copper wires 16 and 17. These in turn are welded to the platinum wires 18 and 19. The molybdenum wires are sealed directly into a piece of special glass 12, which has essentially the same temperature coefficient of expansion as molybdenum. This first seal is simply to insure a rigid support for the hot filament, the outer seal being the one relied upon for vacuum tightness. The outer end, 13, of the support tube is of German glass like the bulb itself, and it is therefore necessary to interpose at *S* a series of intermediate glasses to take care of the difference in expansion coefficients between 12 and 13. The small glass tube 20 prevents short-circuiting of the copper wires 16 and 17. The filament is heated by current from a small storage battery which is well insulated electrically from the ground. In the circuit are placed an ammeter and an adjustable rheostat, and by means of the latter the filament current can be regulated from 3 amp to 5 amp by very fine steps. Over this current range the potential drop through the filament varies from 1.8 volts to 4.6 volts and the filament temperature from 1890 deg. to 2540 deg. absolute. The focusing device consists of a cylindrical tube of molybdenum 21. It is supported by the two stout molybdenum wires, 22 and 23, which are sealed into the end of the glass tube, 12. The electrode is metallically connected to one of the filament leads at 24. Besides acting as a focusing device, it also prevents any discharge from the back of the heated por-

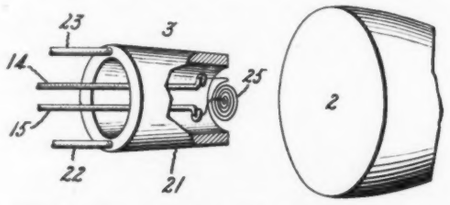


FIG. 3—DETAILS OF CATHODE AND FRONT END OF TARGET

tion of the cathode. The anti-cathode or target, 2, which also serves as anode, consists of a single piece of wrought tungsten having at the end facing the cathode a diameter of 1.9 cm. Its weight is about 100 gm. By means of a molybdenum wire, 5, it is firmly bound to the molybdenum support, 6. The connections and the methods of operating are described and the character-

istics of the new tube are summed up as follows: The tube differs in principle from the ordinary type in that the discharge current is purely thermionic in character. Both the tube and the electrodes are as thoroughly freed from gas as possible, and all the characteristics seem to indicate that positive ions play no appreciable rôle. The tube allows current to pass in only one direction and can therefore be operated from either direct or alternating current. The intensity and the penetrating power of the Roentgen rays produced are both under the complete control of the operator, and each can be instantly increased or decreased independently of the other. The tube can be operated continuously for hours, with either high or low discharge currents, without revealing an appreciable change in either the intensity or the penetrating power of the resulting radiations. The tube in question shows no fluorescence of the glass and no local heating of the anterior hemisphere. The starting and running voltage are the same. The tube permits of the realization of intense homogeneous primary Roentgen rays of any desired penetrating power.—*Phys. Review*, December, 1913.

Three-Phase Meters.—LEOPOLD SCHNACKENBURG.—The author points out that erroneous readings are often obtained with three-phase meters, not because the meters themselves are faulty, but for other reasons like faulty connections, accidental interruptions, etc. For different wrong methods of connection the magnitudes of the errors are investigated by means of diagrams, and examples from practice are given showing that such errors happen quite frequently. Means for avoiding such errors are also discussed.—*Elek. Zeit.*, Dec. 25, 1913.

Cable Testing.—M. KLEIN.—A translation of his recent German article on methods of testing cables.—London *Electrician*, Dec. 26, 1913.

Telegraphy, Telephony and Signals

Measuring Capacity in Telephone Circuit.—A note on a recent British patent (No. 2009, 1913) of G. A. Campbell, O. B. Blackwell and E. H. Colpitts and the Western Electric Company, of this country. To measure capacity unbalances in a telephonic phantom circuit, a testing set is used consisting of a variable capacity and means for connecting it in different combinations between an element of one of the pairs of elements of the phantom circuit and both elements of another of the pairs. Means are also provided for determining when the variation in the connected capacity has equalized the capacity between the elements, as well as for indicating the amount of the equalizing capacity. —London *Elec. Eng'ing*, Jan. 1, 1914.

Prepayment Telephones.—TEUFFERT.—The author describes a prepayment telephone system in which the user cannot get connection until he has paid the required fee. His money is returned automatically if the desired connection is not made. In the exchange the prepayment telephones are not marked differently from other telephones. The exchange operator does not ask the user to pay nor does she supervise the payment. The unskilled user cannot pay at the wrong moment. The mechanism employed is described and illustrated.—*Elek. Zeit.*, Jan. 1, 1914.

Miscellaneous

British Patents.—A list of British electrical patents which will expire during 1914. Among them is one of Marconi for the use of a transformer for coupling circuits in wireless telegraphy, whether receiving or transmitting, to the aerial, the circuit and the aerial being tuned to the same frequency or to a harmonic thereof; the patent of Duddell for his musical arc, Pupin's patent for loading telephone lines, a Cooper Hewitt patent for a mercury-vapor lamp, etc.—London *Electrician*, Jan. 2, 1914.

Book Reviews

TELEPHONE CABLES. A handbook of the design, construction and maintenance of the telephone cable plant. By J. C. Slippy. Pittsburgh, Pa.: J. C. Slippy. 147 pages, illus.

A useful pocket book of reference concerning the specifications, tests, records, inspection and maintenance of standard types of telephone multiple-conductor cable, compiled for the use of engineers and cable men. A number of tables and diagrams are given in the book, advantageously arranged for reference. Only standard sizes and types are considered. The eight chapters of the book relate to the following subjects: Specifications, plans, construction, records, long-distance work, inspection, troubles and costs. The volume will be useful to telephone engineers, cable men and "trouble" men, and all who are interested in the technique of telephone cable installation.

THE LIGHTING BOOK. A Manual for the Layman Setting Forth the Practical and Esthetic Sides of Good Lighting for the Home. By F. Laurent Godinez. New York: McBride, Nast & Company. 110 pages, illus. Price, $1.25.

A book intended for the uninitiated and those untrained in the technics of illumination, explaining the elements of useful and pleasing lighting by either gas or electric lamps. The book is divided into twelve chapters on the following topics: Light and the eye; the misuse of light; light and mind psychology; the modification of light; seeing by light transmitted; shading and redirecting light; light on the path; making the most of light; indirect lighting; individuality in lighting; light in the home; light and decoration. Interior artificial illumination has relations to effectiveness, beauty, protection of the eye, cost, gracefulness and psychological effect. It is wonderful how little the average man realizes these relations until they are brought to his attention specifically. The book should interest all who seek to arrange the lighting of their homes.

LES PROGRÈS DE LA CHIMIE EN 1912. A French translation of the annual reports on the progress of chemistry for 1912. Vol. IX. Issued by the Chemical Society, London. Paris, France: Librairie Scientifique, A Hermann et Fils. 405 pages. Price, 7.5 francs.

This volume indicates not only how much research work is being carried on in chemistry all over the world, but also how many branches of chemistry exist. A scientist would have to be a walking encyclopedia to be able to keep fully in touch with all these different branches. The sections into which the work is divided relate to the following branches: General and physical chemistry; mineral chemistry; organic chemistry; analytical chemistry; physiological chemistry; agricultural chemistry; mineralogical chemistry, and radioactivity. Each section has been drawn up by a separate specialist. Nearly 1200 experimenters and authorities are referred to in the course of the work, which interconnects with mathematics, mechanics and physics, to say nothing of geology, physiology and farming. The volume forms a useful reference book for the student of chemistry or chemical physics.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Combination Tail and License-Number Lamp

A combined tail and license-number lamp fixture, to which any size of number plate can be fastened, is being manufactured by the Combination Tail Light Company, Boston, Mass. The fixture consists of a single metal stamping, which, as shown in the accompanying illustration, has its inside coated with white enamel

COMBINED TAIL AND LICENSE-NUMBER LAMP

to reflect light onto the number plate through the slot at the bottom. The lamp socket, which is fastened to the stamping by a twist-lock joint, may be removed quickly and the entire fixture washed with a hose. These tail-lamp fixtures can be furnished with a single red or blue lens or with a combination of the two as favored by some state legislatures.

Concrete Poles and Lamp Standards of Light Construction

Concrete poles and lighting standards weighing less than two-thirds as much as the ordinary types of concrete structures of the same length are being put on the market by the Chicago Concrete Pole Company, 29 South LaSalle Street, Chicago. It is said that the reduced weight of the poles renders them easily transportable, so that it will not be necessary to carry on construction work at the erection site. Fig. 1, a perspective drawing of a section of one of these poles,

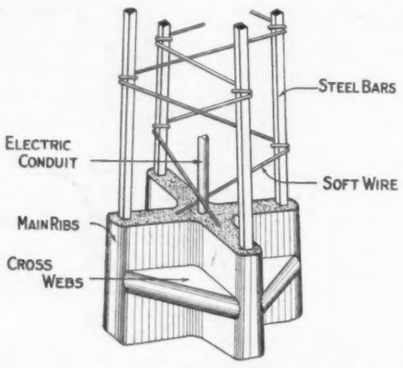
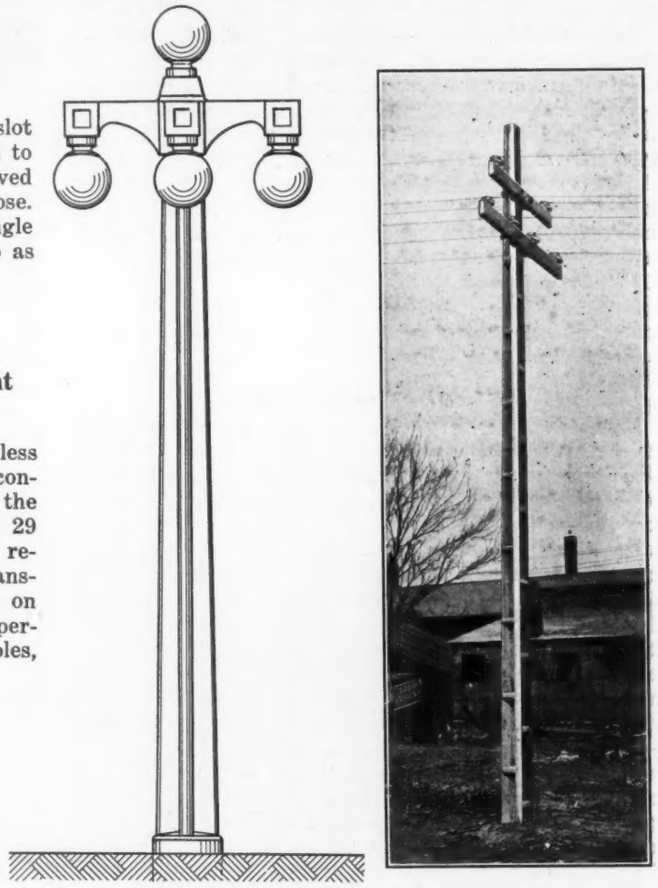


FIG. 1—CONCRETE SECTION AND REINFORCING

shows the position of the high-carbon steel reinforcing rods and illustrates the method by which they are secured in position by two soft-iron wires. The amount of concrete in the poles has been reduced to a minimum, only enough being left to cover the steel properly. Concrete cross webs which act as steps on the line poles are cast monolithic with the longitudinal ribs. Either steel or wooden cross-arms may be used with the line poles, two bolts hooking over the ribs of the pole at the back and being fastened at the front of the cross-arm with nuts and washer, constituting the approved method of cross-arm support. Braces are not needed.

In a test conducted on a 35-ft. pole, such as is shown in Fig. 3, 2600 lb. applied at the top of the pole produced a 31-in. deflection with no permanent deformation. The pole was set 7 ft. in the earth. An examination made when the pole was at the point of greatest deflection failed to show any perceptible cracks. Such



FIGS. 2 AND 3—CONCRETE LAMP-POST AND CONCRETE POLE

a 35-ft. pole measures 14.37 in. square at the base, 4.5 in. at the top and weighs 2200 lb.

The concrete lighting standards (Fig. 2) will not be equipped with steps for climbing nor will the soft steel wire be interlaced between the reinforcing rods. Conduit conducting the electric circuit up the center of the pole leads to a cut-out box at the joint of the extension arms. The switch box had been placed at this point in preference to the usual position near the ground line. The conduit in the extension arms acts as reinforcement for these members. The units will be made in either three-lamp or five-lamp styles, and where additional ornamentation is desired designs may be tooled

on the exterior of the posts. Since crushed quartz and cement are the sole ingredients of these units the effect of tooling the exterior is to produce a surface which sparkles and flashes as the rays of the sun or the lamp are reflected from the faces of the exposed quartz crystals.

Electric Trucks in Government Service

The number of electric trucks in the service of the United States government is continually increasing,

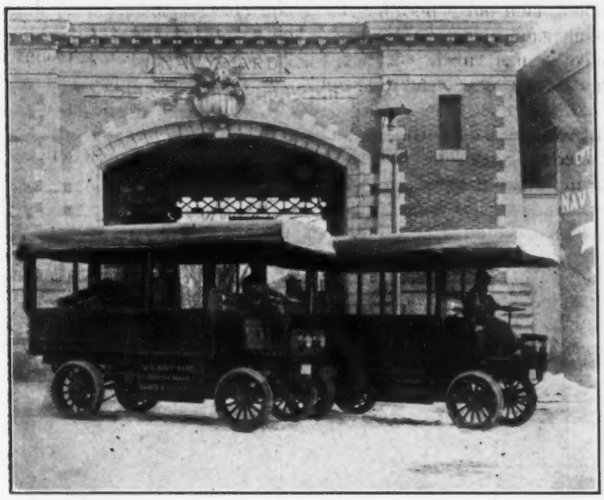


FIG. 1—TWO OF TWELVE ELECTRIC TRUCKS, BOSTON NAVY YARD

and the rapid expansion of the parcel-post field indicates that hundreds more of these vehicles will soon be added for that branch of the Post Office Department.

Eight navy yards, three arsenals, the Government Printing Office at Washington, a naval hospital and two army depots use electric trucks, while in Manila, P. I.,

FIG. 2—ELECTRIC TRUCKS, DIVISION OF COLD STORAGE, MANILA, P. I.

approximately forty are in the service of the War Department and the various branches of the Philippine government. The latter's bureau of supply formerly hired horses and mules from the department of sanitation and transportation of the city of Manila to do its trucking and transportation work. In 1909 a 1-ton General Vehicle truck was installed by the division of cold storage, which furnishes ice, distilled water and refrigeration to the general public as well as to the various government offices. The satisfaction given by this truck was such that in the three years between September, 1909, and September, 1912, twenty-four more trucks of the same manufacture were installed. These wagons range in rating from 1-ton to 5-ton capacity and have given good service under the severe tropical conditions of the Philippine Islands.

Of the sixty-five General Vehicle Company trucks in the service of the United States government thirty-three are in Manila, twelve in New York City, two in

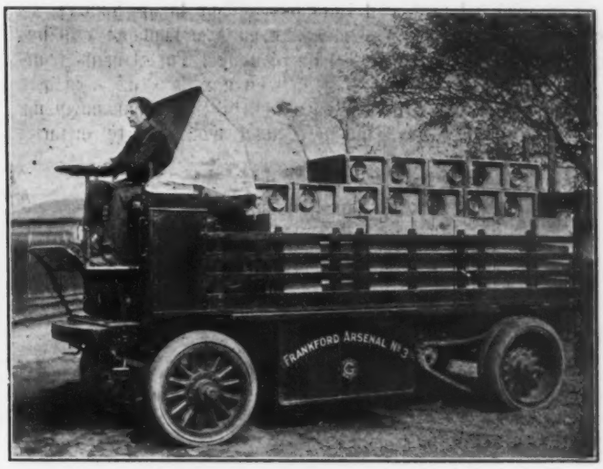


FIG. 3—FIVE-TON ELECTRIC TRUCK LOADED WITH SMOKELESS POWDER, FRANKFORD (PA.) ARSENAL

Boston, two in Philadelphia, one at Frankford, five in Washington, two in Charlestown, two in Brooklyn, one at Portsmouth, N. H., and one at the Puget Sound navy yard. The library of Congress and the Bureau of Standards at Washington each have two.

On account of its reliability and economy of opera-

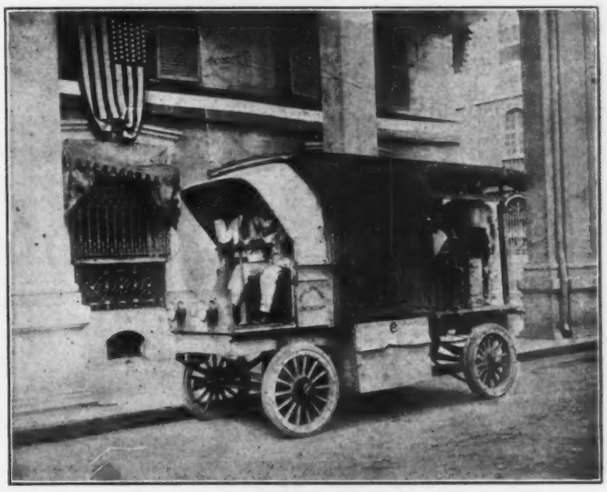
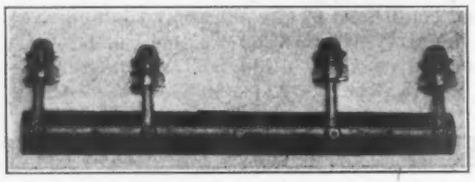


FIG. 4—TWO-TON TRUCKS USED BY PHILIPPINE CONSTABULARY

tion the electric truck has earned the recognition of the government officials, and it is reported that one Washington department which replaced several gasoline and horse-drawn wagons with electric trucks about two years ago has thereby averaged savings amounting to $1,000 annually on each of the battery-driven cars installed.

Iron Cross-Arm of Semi-Circular Section

The Specialty Device Company, Cincinnati, Ohio, has just placed on the market a type of cross-arm made up of seamless boiler tubing. In the process of manufacture, each of the iron tubes is split lengthwise and receives a muriatic acid bath to remove all scale and rust.



CHARCOAL-IRON CROSS-ARM

The clean metal semi-circular sections are then coated with asphaltum paint.

For giving the arm a secure position in the pole gain, a filler plate is placed across the open side of the semi-circle at the center of the arm. The hole for the screw board extends through both the arm and filler plate. Holes for placing pins and through-bolts are bored 0.5 in. in diameter, while holes for the braces are bored 0.375 in. in diameter. The pins used in connection with these arms are of iron cast in such shape that they conform to the circular sections of the cross-arms. No opportunity is given for the pin to slip in any direction after it has been bolted in place. The insulator thread is of the coiled-spring type.

Electric Heat-Storage Apparatus

An electric heat-storage device has been invented by Mr. Charles Hässler, of Stockholm, Sweden, by means of which energy can be utilized at off-peak periods and stored for use at all times. The apparatus consists of a heat-storing "magazine" 1 (Fig. 2), a heat-radiating cover 5, a heat-insulating material 2, the electrical resistors 7, and a heat-regulating device 3. When the

FIG. 1—HEAT-STORING APPARATUS

heater is to be operated the damper 3 is closed so that all the heat generated by the electric resistors 7 is stored in the magazine, which is carefully insulated against heat losses. Whenever it is desirable to have the apparatus deliver heat the damper 3 is opened a certain amount. Heated air in proportional quantities is then forced to pass, as indicated by the arrows in Fig. 2, from the air channels 6 in the heat-storage magazine to the air channels 9 and finally back to 6, thereby giving off heat to the surface 5 and also causing the latter to radiate heat.

By properly adjusting the damper the heat generated by the electric resistances can be conducted at will either to the storage magazine or to the radiating surface, or to both of them. Regulation of the electrically generated heat can also be obtained both as to the time at which the stored heat is to be delivered and the rate at which the heat is to be generated, stored or delivered. Provided that the details of the apparatus are properly dimensioned, it is therefore possible to maintain the temperature of a room or of a certain amount of water or other liquid constant at all times, regardless of the time the electric current is switched off. The apparatus thus takes the place of an electric-heating plant with the electric current available at low off-peak-period rate.

The damper can be regulated manually or automatically by relays in combination with thermometers

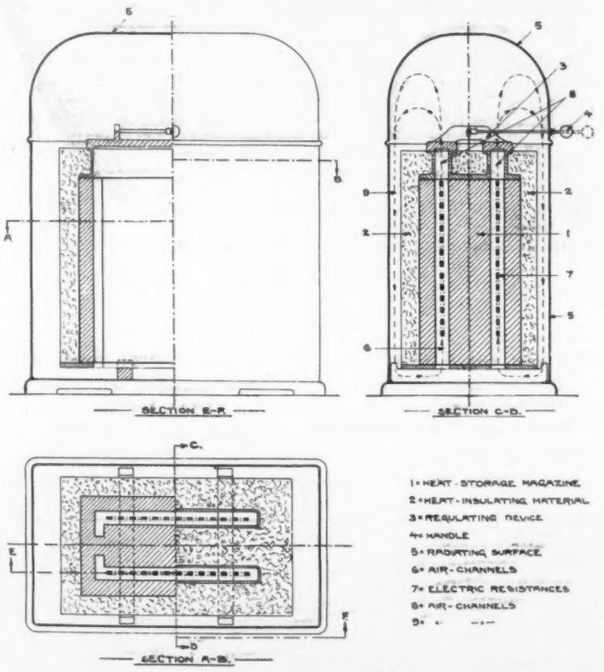


FIG. 2—SECTIONS OF HEAT-STORING APPARATUS

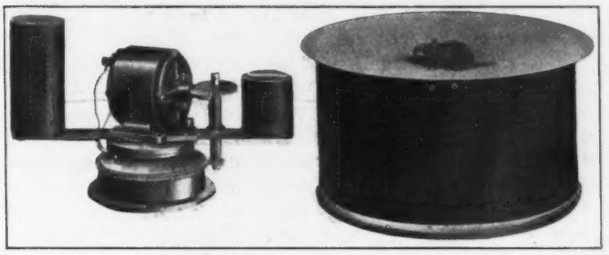
and circuit-breakers to obtain a constant temperature.

The construction of the apparatus in sections makes it possible to construct each part to suit best its own specific functions. The storing magazine proper is constructed so as to obtain the best storing capacity, while the outer surface is designed to radiate the heat in a uniform and rapid manner.

The fact that the heat-conducting air circulates in a closed system of channels within the apparatus is important. The temperature of the circulating air and the heat-storing magazine is therefore independent of the temperature of the surrounding atmosphere. It is possible, therefore, to use very high temperatures in the heat-storing magazine. By experiments with the apparatus shown in the illustrations herewith a temperature in the storing magazine of about 600 deg. C. has been obtained. The apparatus has a storing capacity of about 25,000 kg-cal., and it measures 34 in. high, 14.25 in. wide and 25.75 in. long. The initial cost of the equipment is quite low, owing to its simple construction. The device is patented in several European countries and also in the United States.

Motor-Driven Advertising Device

A motor-driven advertising display known as "the machine of a thousand mysteries" has been brought out by the Electro Novelty Company, 160 North Fifth Avenue, Chicago. A worm gear on the motor shaft drives an intermediate shaft, which in turn engages a rack



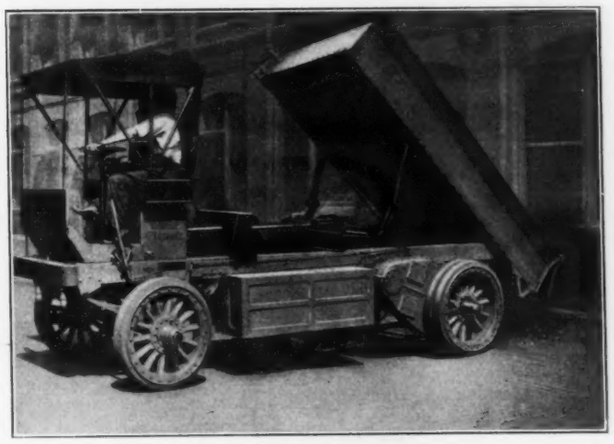
ADVERTISING DEVICE

on the fixed base of the machine. Through these reducing gears the motor thus drives the magnet at the end of its counterweighted arm. Toys placed on the surface of 22-in. glass disk are fitted with light steel bases, and as the revolving magnet sweeps under them the toys are attracted and follow the circular path of the revolving arm. Striking effects are obtained by placing more than one toy on the surface of the disk at one time, as only a portion of the figures will be carried by the magnet at each round.

The completed black vulcanized fiber case measures 22 in. in diameter and is 11 in. high. Motors and magnets are supplied for use on either alternating-current or direct-current circuits. It is said that the device can be operated for about 1.5 cents a day.

Four-Ton Electric Dumping Truck

The Baker Motor Vehicle Company, of Cleveland, Ohio, has developed a new 4-ton dumping truck body which is mounted on the company's standard 4-ton chassis.



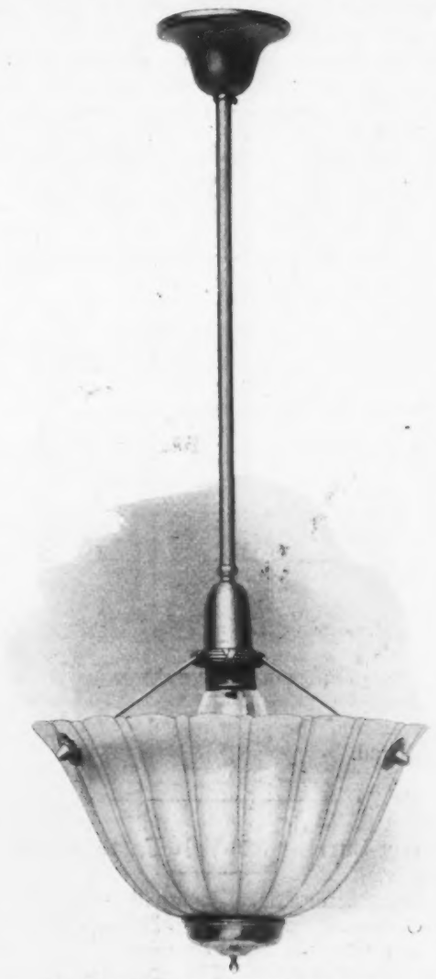
ELECTRIC DUMPING TRUCK

The dumping body is made of sheet steel reinforced with angle iron, and the floor is formed of steel channels riveted together and covered with a smooth steel plate. The tail gate is locked and unlocked by a lever at the side of the driver's seat. The body can be tipped to an angle of 45 deg. The tipping is done by two arms, one on each side of the body. These arms are fastened to a large steel crank shaft which revolves in one direction only. Two-thirds of a revolution is required to tip the body and one-third to lower it. This operation permits the body to come down to its position on the chassis frame in half the time required to raise it for dumping. The body may be raised and lowered back to its regular position in fifty seconds.

The dumping is done either by a hand crank or an auxiliary motor mounted under the seat, which is driven through a shaft and eight-spur worm-gear reduction on the crankshaft. This shaft runs in oil and is contained in a dust-proof housing.

Detachable-Bowl Semi-Indirect Lighting Fixture

The semi-indirect lighting fixture illustrated herewith is the product of the Multilux Illuminating Com-



SEMI-INDIRECT LIGHTING UNIT

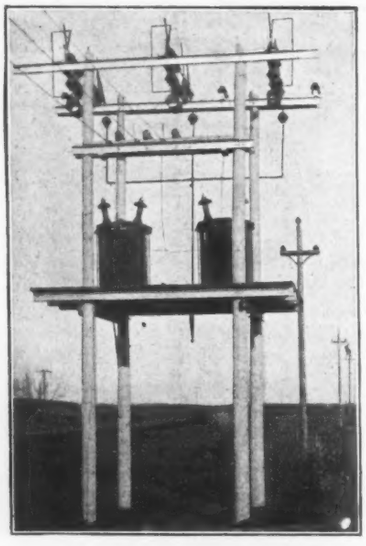
pany, Cleveland, Ohio. The bowl, which is made of effulgent glass, is supported by three detachable brass-plated steel suspension rods. One end of each rod is ball-shaped and fits into a groove in the socket cover. The opposite end is equipped with a hinged ornamental stud which makes the bowl self-aligning and prevents the rod from falling out.

The glassware can be cleaned by simply lifting one of the suspension rods from the groove in the socket cover and swinging the bowl down on the other two rods. A spring-cap receptacle is attached to the bottom of the bowl for holding dirt accumulations which

would otherwise mar the appearance of the bowl. This cap does not diminish the efficiency of the glassware to any great extent, nor does it cast an appreciable shadow because the intensity of light at the end of a tungsten lamp is not very high.

Outdoor High-Tension Substation

The increasing tendency toward standardization of equipment is well shown in the acompanying illustration of a standard 22,000-volt three-phase substation manufactured by the Delta-Star Electric Company, Chicago, Ill., which can be shipped complete and ready for erection. The central-station manager is thus enabled to order a complete "ready-to-use" station just as easily as a package of lamps or meters. All the parts of the outfit shown are of standard dimensions, and in erecting the equipment a minimum expenditure of time and money is therefore necessary. The high-tension control and protective equipment is of the



OUTDOOR SUBSTATION

"MRC" type, and the poles may be of either wood or steel as desired.

Direct-Current 220-Volt Factory Horn

An electric factory horn designed to operate on 220-volt direct-current energy without sparking at the vibrator contacts has been developed by the Holtzer-Cabot Electric Company. The difficulty heretofore in making vibrator horns operate satisfactorily at this voltage was in finding a suitable resistance and condenser which combined would prevent arcing at the vibrator contacts. With the resistance wire selected and the method used in winding it the proper reactance for 220-volt operation is now obtained.

Electric horns are sometimes better adapted for code signaling than are bells, as the sound of the latter may be mistaken for the usual noises occurring around a factory, or vice versa. The electric horn illustrated is similar in most details to the other horns manufactured by the company. The life of the vibrator springs is considerably increased by clamping them between fiber rather than metal grips, as the latter hold the springs so rigidly that fractures are often caused by crystallization. The average power taken by these horns is about 20 watts, but when connected up with too small wire and operating on less than normal voltage the momentary starting current will cause energy losses in the wiring which should not be attributed to the horn. The horns will operate on one-third less

ELECTRIC FACTORY HORN

voltage than that for which they are rated, although such practice is not recommended.

General Utility Portable Lamp

A portable lamp which can be adapted to a variety of conditions is being manufactured by the Wallace Novelty Company, 299 Madison Avenue, New York. This device consists of a lamp mounted on its base by a practically universal joint, while in the base is concealed a reel on which the flexible connecting cord can be wound to take up slack. Fastened to the lamp bulb by an ingeniously designed clip is a reflector which can be adjusted to any position, making the lamp suitable

PORTABLE LIGHTING FIXTURE

for the office, home or vacation trip. Also mounted in the base is a rubber suction cup and a combined hook and clamp for fastening the device to a mirror, chair, bed or wall. To wind the cord on the reel it is necessary to use the lamp bulb and socket as a crank. The portable lamp is 12 in. high and weighs only 1.5 lb. including 10 ft. of silk flexible cord and plug.

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Information on Generating and Transmission Apparatus Wanted.—C. D. Orr, of Yazoo City, Miss., is anxious to obtain information from manufacturers of all equipment and supplies necessary for the erection of a 5000-kw generating station and a transmission line about 100 miles long. Catalog prices and correspondence are invited by Mr. Orr, addressed as above.

Small Michigan Station Making Good Showing.—The Hart Milling & Power Company, of Flushing, Mich., has in operation a 2300-volt, sixty-cycle plant, of 150-kw rating, supplying electric service to that village. Its business, started a short time ago, has shown such a rapid growth that it is contemplating within the year the installation of an additional 250-kw to 300-kw generating unit.

Electric Steel Company to Build New Plant.—The site for a new steel plant has been acquired by the Electric Steel Company, of Indianapolis, Ind., and construction work will be started shortly. The plant will be located at Speedway, a suburb adjoining the Indianapolis Motor Speedway, and in it there will be made a high grade of steel especially adapted for use in automobile construction. Electric furnaces are used in the production of this steel.

New Electric Truck Being Tested.—The Wagenhals Motor Company, of Detroit, Mich., has put out for test purposes a new electric commercial car. The general plan of the car is the same as that of the company's regular three-wheel gasoline vehicle of 800-lb. carrying capacity. A General Electric motor is used, supplied with energy from a twenty-four-cell "Exide" storage battery. The electric vehicle is planned to sell for about 15 per cent more than the gasoline car of the same carrying capacity.

Electric Vehicle Factory Closed for Inventory.—The Kentucky Wagon Manufacturing Company, of Louisville, Ky., maker of commercial electric vehicles, has been closed down for about two weeks, during the annual inventory, but will resume operations shortly. R. B. Board, president of the company, recently announced a complete reorganization of the factory force. No reduction of the force was made, except that several foremen were replaced. The sales department is to be reorganized before February.

Planning Western Lamp Factory.—The Westinghouse Lamp Company, which recently moved its executive offices from Bloomfield, N. J., to New York City, is contemplating the establishment of a Western factory, and the plant formerly used by the Kissel Motor Car Company, at Milwaukee, Wis., is favorably considered. Negotiations are now under way toward securing this factory. This move represents the first step in a general policy of expansion of manufacturing facilities to meet the growing demand for Westinghouse lamps.

Meter Shipments by Parcel Post.—In a test recently conducted by the Sangamo Electric Company, Springfield, Ill., four electric meters were shipped from the factory to Boston, Mass., over a route which necessitated four handlings at transfer points. The meters were packed in a corrugated board and a wooden box without excelsior. Upon their return to the factory over the same route tests showed them to be as accurate as when they left the factory. As the result of this trial and of the increase in parcel-post weight limit the Sangamo company are planning to use the mails extensively for shipments up to and including four meters.

Westinghouse Company Reduces Hours Temporarily.—Rumors to the effect that the Westinghouse Electric & Manufacturing Company had instituted a reduction in the salaries of its employees were explained by the recent statement of G. E. Tripp, chairman of the board of directors of that company, who said that no such step has been either taken or contemplated, but that the factory force has been put temporarily on a schedule of forty-five hours per week, instead of the usual fifty-four-hour schedule, because of a decline in production activity. C. A. Terry, vice-president of the company, stated to an *Electrical World* representative in a recent interview that this plan had been adopted in place of the usual method of reducing the force, as business showed a falling off.

$25,000,000 for Electric Auto Starters in 1914.—Mr. E. L. Jones, of the Jones Electric Starter Company, speaking before the Chicago Jovian League on Jan. 19, said that it had been conservatively estimated that $25,000,000 would be spent during the year 1914 for automobile electric-starting equipments. About $2,500,000 will go to the manufacturers of storage batteries and a like amount will be spent for gears and silent chains. The starter manufacturers' business will amount to about $15,000,000 and the remainder will represent profits of agents and dealers. Questioned about the extra cost of operating a car with an electric starter, Mr. Jones quoted from tests made by the Packard company on a 32-hp machine in which the additional expense as shown in the gasoline and oil bills was $7.20 for 10,000 miles. This test assumed that the car would be started once every three miles and that the lamps would be operated continuously.

Sulphur Mining Equipment for Texas.—Westinghouse, Church, Kerr & Company, of 37 Wall Street, New York, are at present engaged in the construction and equipment of a second plant for S. M. Swanson & Sons, at Freeport, Tex., where extensive sulphur mining operations are already being carried on. The process is a novel one and is said to be much more economical than the usual method of refining. The sulphur occurs in spongy rock strata about 800 ft. underground. Holes are drilled into these deposits and water at about 330 deg. Fahr, and between 100 and 250 lb. per sq. in. pressure, is forced into the sulphur veins. This hot water melts the sulphur, which is then brought to the surface by means of air lifts. The sulphur obtained in this way is said to be in a very pure state. A generating station is in process of construction and will probably be equipped with a Westinghouse three-phase, sixty-cycle turbo-generator. From this station a wooden-pole, three-phase, 2200-volt transmission line will be built to the company's docks to supply electricity for the ship-loading equipment and for pumping oil fuel for the boilers.

Commercial Vehicles to Be Sold Under New Plan.—The General Motors Truck Company, of Pontiac, Mich., has adopted a new policy, regarding the sale of its gasoline and electric commercial vehicles, which is worthy of notice. At the present time there is much agitation in every line of merchandising for the sale of a service along with the product sold, and the character of the service runs all the way from the maintenance of repair stations and the guaranteeing of rapid replacements to the providing of skilled operators. Also there has been a tendency toward longer credits, particularly in the automobile trade. This company claims to have found that its service arrangements and credit policy were not producing the best results, either for itself or its customers, and it proposes in the future to sell its product without service plan and on shorter credits, claiming that it can reduce the prices on its cars materially by so doing. In place of the old service arrangements, the company plans to put extra effort on the proper selection of units for each customer's individual needs, in other words to attack the trouble at its source and by good engineering at the time of sale eliminate to a large measure the necessity for service arrangements. It will be of interest to note what success attends this move, counter to the general tendency of the day.

Manufacturers of Transmission Line Specialties Busy.—The following statement by J. T. Hickey, of the firm of Hickey & Schneider, 227 Fulton Street, New York, makers of transmission line specialties, gives an idea of the present activity in that branch of the electrical industry as seen by his company. He says, in part: "We wish to state that business during 1913 was, on the whole, very satisfactory; in fact, greatly surpassed our expectations. As for the coming year, we have secured enough orders since the first of January for our line-disconnecting switches and splicing sleeves to keep us busy for many months to come, and we have in view and have quoted prices on about as much work as we can conveniently take care of, under present conditions, for the rest of the year. We expect to keep our present factory busy for some time to come."

Storage-Battery Business Satisfactory.—The Willard Storage Battery Company, of Cleveland, Ohio, is at present working on a schedule of 1000 cells a day and expects this activity to continue. A large part of this production goes into automobile equipment sets for starting and lighting and ignition, but a good business is done in train-lighting equipment, which line is growing steadily. In the latter field the company has recently prepared a particularly favorable contract form which guarantees the performance of the battery under proper handling and provides for replacement of positive elements which fail to meet the guarantee. Some export business is done and a method has been devised for shipping the batteries in a charged state without the electrolyte. The present battery put out by the Willard company is of specially rugged construction and is capable of being sealed up tight against both air and water. The burnt-lead connections are standard, but an excellent bolted connection is used where desired. For automobile work the 6-volt battery is predominant at the present time, but a gradual drift toward the 12-volt battery is noticed.

Unified Operation of Chicago Surface Railways.—The Mayor and City Council having sanctioned the unified operation of the surface street railways of Chicago owned or controlled by the Chicago City Railway Company and the Chicago Railways Company, an organization has been formed for unified operation, known as the Chicago Surface Lines. The board of operation provided for consists of Henry A. Blair, John M. Roach, Charles C. Adsit and Wallace Heckman, representing the Chicago Railways Company, and Leonard A. Busby, Ira M. Cobe and Frank O. Wetmore, representing the Chicago City Railway Company. Mr. Blair was elected chairman of the board, and he and Messrs. Cobe and Busby were made members of the executive committee, Mr. Cobe being chairman of the executive committee. John J. Mitchell, president of the Illinois Trust and Savings Bank, was elected umpire to determine any differences that may be referred to him. Officers of the Chicago Surface Lines, acting under the supervision of the board of operation, were elected as follows: President, Leonard A. Busby; vice-president, Williston Fish; general auditor, John J. Duck; treasurer, Markham B. Orde; assistant treasurer and secretary, Fred D. Hoffman; assistant secretary, Frank L. Hupp; general counsel, W. W. Gurley. Universal transfers will be given on Feb. 1, and through-routing will be put into effect gradually thereafter.

Cedar Pole News of Interest.—At the annual meeting of the Western Red Cedar Association in Spokane, Wash., on Jan. 12, some matters of interest to users of cedar poles were brought up in the address of H. C. Culver, retiring president of the association. Mr. Culver's remarks were in part as follows (referring to Western red cedar): "During the first part of 1913 poles, posts and piling moved freely at fair prices, but a general recession of trade took place during the latter half of the year, and to-day the industry is in a very unsatisfactory state. I believe, however, that a more healthy condition will shortly prevail. Stocks are low but fairly well assorted. Owing to several adverse factors, it is expected that the output during the present winter will be greatly restricted. In the United States there are more than 800,000 miles of pole lines in use by the electrical industry, and on these lines there are in service more than 32,000,000 poles. The annual renewal requirements are over 4,000,000, and of these large totals about 65 per cent are cedar. We should use our utmost efforts to have the National Electric Light Association adopt our specifications for cedar poles. Since large quantities of poles are purchased annually under specifications suggested by that body, the advantages of such action are obvious. A display of Western red cedar at the Forest Products Exposition in Chicago, April 30 to May 9, and in New York, May 21 to 30, would no doubt prove a great advantage to our industry." Favorable action was taken by the delegates upon the two suggestions offered.

Hydroelectric Expansion in New England.—Rapid progress is being made by the New England Power Company in the extension of its service throughout central Massachusetts and the Berkshire district of the State. Through its alliance with the Connecticut River Transmission Company there is now available an installation rated at about 50,000 hp on this system, and more than 200 miles of high-tension lines are in service. Construction is in progress on the 120,000-volt steel tower line between the operating center of the system at Millbury, Mass., and Providence, R. I., and in the late spring it is expected that energy will be delivered to the Narragansett Electric Lighting Company for local distribution. The Somerset (Vt.) reservoir of the New England company is now about one-half filled, and within a few weeks the full 23,000,000,000-gal. capacity of this new basin will be attained, if no unforeseen droughts occur. Generating plant No. 5 will be opened soon, augmenting by 120 per cent the developments already in operation on the Deerfield River. A notable increase of customers has also been gained. The company has closed contracts with the Amherst Power Company, Fitchburg Gas & Electric Light Company, Central Massachusetts Electric Company, Marlboro Electric Light Company, Gardner Electric Light Company, Worcester Electric Light Company and the Worcester Suburban Electric Company. Of the last-named organization the New England Power Company interests have purchased control. In addition to the large network of trolley lines operated in central and southern Massachusetts by this power system, the Hoosac Tunnel electrified train service of the Boston & Maine Railroad is now being operated by hydroelectric energy, the Zylonite turbine station being held in reserve. The Berkshire Street Railway is another recent purchaser of this energy. Gross earnings of the New England Power Company's affiliated transmission lines in 1913 totaled $777,846, and these are now running at the rate of over $1,000,000 per year. The gross earnings in 1912 were $514,445, those of 1911 being $405,206 and of 1910, when the first lines were placed in service, $270,202. Earnings for 1913 show a surplus of $70,000 above operating expenses, proportionate bond interest and dividend requirements of all the properties. Baker, Ayling & Company, of Boston, Mass., are financing these developments, which are under the active management of Chace & Harriman, Inc., of 50 Congress Street, Boston. An extended description of the New England Power Company's system was printed in the *Electrical World* of Dec. 28, 1912.

NEW YORK METAL MARKET PRICES

	Jan. 13 Bid	Jan. 13 Asked	Jan. 20 Bid	Jan. 20 Asked
Copper:				
Standard, spot*	....	....	....	14.50
	Selling Prices		Selling Prices	
	£ s. d.		£ s. d.	
London, standard, spot*	62 17 6		64 12 6	
Prime Lake	14.50	....	14.50	to 14.62½
Electrolytic	14.25	....	14.30	to 14.40
Casting	14.00 to 14.12½		14.15	to 14.25
Copper wire base	15.50	....	15.50	....
Lead	4.10		4.10	
Nickel	40.00 to 45.00		40.00	to 45.00
Sheet zinc, f.o.b. smelter	7.50		7.50	
Spelter, spot	5.25 to 5.35		5.25	5.35
Tin, spot	36.85 to 37.00		37.70	to 38.00
Aluminum:				
Prompt delivery	18.75 to 19.00		18.75	to 19.00
Future	18.50 to 19.00		18.75	to 19.00

*OLD METALS

Heavy copper and wire	13.50	13.50
Brass, heavy	8.75	8.75
Brass, light	7.75	7.75
Lead, heavy	4.05	4.05
Zinc, scrap	4.25	4.25

*COPPER EXPORTS

Total tons to Jan. 20	20,415

*From daily transactions on the New York Metal Exchange.

Corporate and Financial

Montana Power Company Redeeming Bond Issue.—The outstanding $977,000 first mortgage sinking-fund 6 per cent gold bonds of the United Missouri River Power Company, dated March 1, 1906, have been called for redemption on March 1 by the Montana Power Company at 105 and interest.

Chicago Manufacturer Declares Stock Dividend.—The Kellogg Switchboard Company, of Chicago, Ill., has declared a stock dividend of 25 per cent, in addition to the regular 3 per cent quarterly dividend, which is payable Feb. 3. This move recalls the fact that a similar stock dividend of equal amount was declared last January. The officers and directors of the company for the past year have been re-elected.

Adams-Bagnall Electric Company Stock Increase.—At the recent annual meeting of the stockholders of the Adams-Bagnall Electric Company, in Cleveland, Ohio, a new issue of $300,000 in 7 per cent cumulative preferred stock was authorized. This stock will be taken by holders of the $600,000 existing stock and the proceeds of the sale will be used to finance the construction of new buildings and to pay for improvements already completed. Recently the company's earnings have been largely devoted to the expansion of its production facilities.

Mexican Light & Power Company, Ltd., Suspends Dividends.—In view of the unsettled state of Mexican affairs, the Mexican Light & Power Company, Ltd., has decided to suspend the payment of dividends on its common stock, which payment has been made at the rate of 4 per cent per annum for a number of years. The statement of this change of policy was preceded by an explanation to the stockholders of the reasons leading up to it. For some years it has been the custom to declare the quarterly dividends in advance on the basis of estimated earnings for the year. However, during the last three months the conditions in Mexico have not improved, and it is not possible to forecast the earnings with any degree of certainty, so it was judged best to discontinue, temporarily, the payment of common-stock dividends.

Pacific Coast Utility Floats Bonds.—Through a syndicate the Puget Sound Traction, Light & Power Company has just put on the market a seven-million-dollar issue of five-year 6 per cent mortgage gold bonds, which were sold to meet the maturing, on Feb. 1, of $7,500,000 of the company's two-year 5 per cent mortgage gold notes. The new issue is secured by a first mortgage on substantially all of the property formerly owned by the Seattle-Tacoma Power Company, before its consolidation, in January, 1912, with the Pacific Coast Power Company, the Seattle Electric Company, the Puget Sound Power Company and the Whatcom County Railway & Light Company. The other utility concerns now included in the Puget Sound system are the Pacific Northwest Traction Company and the Puget Sound Electric Railway. A present installed rating of 108,900 hp in electric generating equipment is possessed by the plants of the company, and of this over 70 per cent is hydraulically developed. During the fiscal year ended Dec. 31, 1913, the gross earnings of the system totaled $8,613,599 and the operating expenses plus taxes amounted to $5,008,375, leaving net earnings of $3,605,224. Upon payment of the notes falling due Feb. 1 the outstanding capitalization of the Puget Sound Traction, Light & Power Company will be $20,112,300 common stock (now paying 4 per cent) and $14,792,100 of 6 per cent cumulative preferred stock.

Annual Report of the Dayton Power & Light Company.—The annual report of the Dayton Power & Light Company for the fiscal year ended Dec. 31 showed that the gross business amounted to $740,349, representing a gain of $53,460 over the figures for 1912. Operating expenses, however, showed a very large increase during 1913, being $90,035 more than in the previous year, so that the effect of the increase in gross was more than offset and net earnings for 1913 were $45,635 less than in 1912. The surplus for 1913 was $10,150. In his report to stockholders F. M. Tait, president of the company, touches upon the effects of the spring floods and the present outlook as follows: "During the flood both of our plants were under water for more than fifty hours, and it was forty-eight hours later before the water receded sufficiently to allow us to get into the plant. The company was one of the first to aid the sufferers, and its contribution of $50,000 to the flood prevention fund did much to help swell the total to $2,159,744. Other help was extended gratis to the business men of the city, in the matter of supplying electric pumps to remove the water from the buildings. The value of the feeling of cordiality now entertained by the people of Dayton toward the company is amply demonstrated by the fact that 73 per cent more meters were installed in 1913 than in 1912. The outlook for business in 1914 is extremely bright, and I believe it will be the most profitable year the company has ever had."

Last Move in the Columbus Utility Merger.—At the annual meeting of the Columbus (Ohio) Edison Company stockholders voted to sell the property and assets of the company to the Columbus Railway, Power & Light Company for a consideration in stocks of the latter company, as provided under the merger agreement. The consolidation of all public utility properties in Columbus, with the exception of the Columbus Light, Heat & Power Company, will become effective Feb. 2, the Columbus Edison having been the last corporation to act on the consolidation. The Columbus Light, Heat & Power Company will remain outside the merger, but its properties will be operated by the Columbus Railway, Power & Light Company, under the existing lease to the Columbus Railway & Light Company. At the annual meeting of the Columbus Light, Heat & Power Company the board of directors identified with the Columbus Railway & Light interests retired and was succeeded by a new board representing the former officers and directors of the Columbus Public Service Company, which the Columbus Light, Heat & Power succeeded. C. L. Kurtz was elected the new president. It is expected that after the consolidation has been in effect for some time steps will be taken by which the Columbus Light, Heat & Power Company will also enter the merger and thus place all the public utility properties of Columbus under one owning, as well as one operating, corporation. In the *Electrical World*, issues of Nov. 29 and Dec. 6, details concernnig this merger were given. The reorganization, which has been contemplated for some time, was officially approved on Nov. 26, 1913, through the efforts of Mr. S. G. McMeen, president of the Columbus Railway & Light Company.

National Carbon Company Matters.—On Jan. 10 a circular letter was sent to the stockholders of the National Carbon Company, of Cleveland, Ohio, announcing the date of the annual meeting at Trenton, N. J., as Feb. 16. At that time the stockholders will be asked to approve a plan whereby the capital stock of the company will be increased from $10,000,000 to $17,600,000. At present the company has outstanding $5,500,000 of common and $4,500,000 of 7 per cent non-cumulative preferred stock. It is proposed to increase the common stock to $12,000,000 and the preferred stock to $7,600,000, making the latter 7 per cent cumulative. As a reward to its faithful employees the company plans to set aside $500,000 of the new common stock, which will be sold to such as are interested. In a letter from James Parmelee, president of the company, the reasons back of the proposed financing are explained as follows: "For several years past the company's business has grown largely along lines dictated by the requirements of the trade and industry, and the board of directors and officers of the company have been making investments and acquiring interests in these and other collateral lines which have been profitable and which require further expansion with equal promise of profit. The company has constructed a new plant in Canada and is now building one in New Jersey, and it has other plants in contemplation. The time has arrived when further expansion and expenditure—either in cash or stock—become necessary to maintain the company's business and meet the increasing and varying demands of the trade. The directors feel that by this financing they will be placing the company upon a more solid foundation, and that the preferred stock will be placed in an even stronger position than it is at present." The principal plant of the National Carbon Company is in Cleveland, and its other Ohio plants are at Fremont, Fostoria and Lancaster. It has factories at Noblesville, Ind.; Clarksburg, W. Va.; Jersey City, N. J., and Niagara Falls, N. Y., in addition to the new ones above mentioned.

Business Notes

The Sanborn Electric Company, of Indianapolis, Ind., has moved into its new store and offices at 309-311 North Illinois Street in that city.

Thomas Howe, formerly connected with the firm of Edwards, Sager & Wooster, has established an office of his own at 2 Rector Street, New York, for the practice of patent law.

The Wagner Electric Manufacturing Company, of St. Louis, Mo., has announced the removal of its Boston office to 77 Franklin Street. Brooks Faxon continues in charge of the office.

Charles G. Robinowitch has sold his interest in the Metropolitan Electrical Supply Company, of 76 West Thirty-sixth Street, New York, and established an office at 48 Warren Street in that city to deal in electrical specialties.

The Dubilier Electric Company, Inc., of 63 Fifth Avenue, New York, has secured the services of A. C. N. Herdling as general sales manager. Mr. Herdling was for twelve years with the American Telephone & Telegraph Company.

The De Laval Steam Turbine Company, of Trenton, N. J., has appointed as its Chicago manager, with offices in the People's Gas Building, S. Wolff, formerly manager of the Cleveland office of the Allis-Chalmers Manufacturing Company.

The Held Company, of 11-17 South Desplaines Street, Wilmington, Del., has started the manufacture of a line of ozone water sterilizing apparatus. E. S. Eppstein is president of the company; L. H. Hart, vice-president, and George Starmann, secretary.

H. M. Byllesby & Company, of Chicago, Ill., announce the appointment, effective Jan. 1, of G. F. Maddock as manager of their department of examinations and reports. Mr. Maddock has had an exceptionally broad training along public utility lines and is admirably fitted for the position.

The Hart & Hageman Manufacturing Company, of Hartford, Conn., has announced the election of Shiras Morris as president and treasurer, succeeding the late A. H. Pease. C. A. Pease is the new vice-president, A. L. Shipman is secretary, and McKew Parr is general sales manager.

Harold Almert, until recently in charge of the department of examinations and reports of H. M. Byllesby & Company, has opened an office for himself at 737 Insurance Exchange, Chicago, as an engineering expert in evaluation and rate-making. Mr. Almert is an associate of the American Institute of Electrical Engineers and a member of the Western Society of Engineers.

The Ideal Electric & Manufacturing Company, of Mansfield, Ohio, has recently reopened a Chicago office in the Fisher Building, under the direction of J. A. Adamson, who was formerly connected with the Mechanical Appliance Company, of Milwaukee, Wis. C. F. Reuter has succeeded R. H. Elder in charge of the San Francisco office of the Ideal company, at 425 Rialto Building.

New Industrial Companies

Griffiths & Pierce, Inc., of Utica, N. Y., has been incorporated by G. Griffiths, W. Griffiths and P. Jones, of Utica, N. Y. The company is capitalized at $50,000 and proposes to do a general contracting business, install electric systems, etc.

The American Electric Car Company, of Portland, Maine, has been incorporated with a capital stock of $1,500,000 to manufacture and deal in electrical and mechanical devices of all kinds and in automobiles. The officers are A. F. Jones, president, and T. L. Croteau, treasurer, both of Portland.

The Turbo Company, of Perth Amboy, N. J., has been incorporated with a capital stock of $125,000 to manufacture internal-combustion turbines, gas compressors, general machine and engineering work. The incorporators are W. H. Considine, G. W. Ryan and A. W. H. Griepe, of New York, N. Y.

The International Engineering & Development Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $300,000 for the purpose of carrying on a mining, civil and electrical engineering business. The incorporators are H. E. Latter, W. J. Maloney and N. P. Coffin, of Wilmington, Del.

The Century Manufacturing Company has filed articles of incorporation with a capital stock of $100,000 under the laws of the State of Delaware for the purpose of manufacturing and dealing in electric signs and supplies for manufacturers of same. The incorporators are J. Bard, H. H. Snyder and M. S. Rohrer, of Lancaster, Pa.

The Magno Supply Company has filed articles of incorporation under the laws of the State of Delaware with a capital stock of $50,000, to install mechanical, pneumatic or other systems of signaling, interlocking, etc. The incorporators are F. R. Hansell, of Philadelphia, Pa.; George H. B. Martin and S. C. Seymour, both of Camden, N. J.

The E. R. Mason Company, of New York, N. Y., has been chartered with a capital stock of $30,000 to manufacture and deal in electrical and mechanical tools and devices. The incorporators are Edwin R. Mason, 2038 Grand Central Terminal; James Burke, Jr., 87 Nassau Street, both of New York, N. Y., and Bernard Rountree, of Oradell, N. J.

Trade Publications

Induction-Motor Panels.—Bulletin No. A4178, recently issued by the General Electric Company, describes its panels for controlling three-phase induction motors at voltages of from 110 to 2200.

Calendar.—The Archbold-Brady Company, Syracuse, N. Y., is distributing a calendar, on which is a pad 5¼ in. by 8¼ in., one sheet for each week, with space for memoranda for each day.

Railway Motors.—The General Electric Company has issued Bulletin A4171, devoted to a description of its ventilated railway motors. The bulletin supersedes a previous bulletin on this subject.

Charging Panel.—The Roller-Smith Company, 203 Broadway, New York, has issued a ten-page pamphlet fully describing and illustrating its automatic charging panel for use with isolated storage-battery lighting plants.

Electric Appliances.—The Dubilier Electric Company, Inc., 63 Fifth Avenue, New York, has recently sent out a set of bulletins describing and illustrating its resistance units, heating, medical, wireless and other apparatus.

Wire Specialties.—An elaborate illustrated catalog of 224 pages has been issued by the Wright Wire Company, Worcester, Mass., which shows the unusual variety of wire specialties manufactured by this company. The catalog is well printed and well arranged and contains a number of useful wire tables.

Oil Engine—The Fulton Iron Works, St. Louis, Mo., have issued a four-page leaflet, containing across the entire center pages a photograph of the members of the St. Louis Engineers' Club taken in the testing department of the company on the occasion of an exhibition of the first Fulton-Tosi oil engine. The back page of the leaflet gives a brief description of this apparatus.

Switchboards.—Catalog 10 just issued by the Trumbull Electric Manufacturing Company, of Plainville, Conn., contains 200 pages of interesting information for the users of switches, panelboards, switchboards, cabinets, cut-outs, receptacles and various wiring supplies. Complete tables of dimensions and prices are included, together with a number of illustrations of the apparatus described and a good index.

Overhead Traveling Crane.—A late bulletin of the Pawling & Harnischfeger Company, of Milwaukee, describes and illustrates the "Type H" crane made by that company. This equipment is said to be as safe, serviceable and durable as can be made consistent with good crane operation. Each hoisting mechanism is provided with a limit switch which will automatically stop the lifting motor if the bottom block is raised too high.

Personal Mention

Mr. M. A. Macfadden has been appointed to the position of superintendent of street lighting at San Diego, Cal.

Mr. J. S. Schlumberger has been appointed superintendent of the municipal electric-light plant at Marietta, Ohio.

Mr. Henry Floy, consulting engineer, who has been on a pleasure trip in Cuba, returned to New York on Jan. 20.

Mr. Peter Reiss has been elected president of the Sheboygan (Wis.) Railway & Electric Company as successor to Mr. E. Gonzenbach.

Mr. James Loftus has been appointed business manager of the commercial department of the Ohio Light & Power Company, Tiffin, Ohio.

Mr. J. G. W. Johnson has resigned as superintendent of the Consumers' Power Company, of Stillwater, Minn., after twenty years of service.

Mr. Maurice Coster, manager of the export department of the Westinghouse Electric & Manufacturing Company, is now in Havana, Cuba, on business.

Mr. W. O. Pratt, for many years connected with the Southern Power Company, Charlotte, N. C., has opened up an office as engineer and contractor in Gastonia, N. C.

Mr. Howard J. Thompson, general manager of the State Center Electric Company, will assume full charge of the Bellefonte (Pa.) Electric Company on Feb. 1 as successor to Mr. C. G. MacAvoy.

Mr. B. Lund has been appointed superintendent of the Consumers' Power Company, Stillwater, Minn., as successor to Mr. J. G. W. Johnson, resigned. Mr. Lund has been with the company for three years.

Mr. J. B. Whitworth, superintendent of distribution for the Schuylkill Gas & Electric Company, Mahanoy City, Pa., has accepted a position with the Sterling Consolidated Electric Company, Tower City, Pa.

Mr. Howard S. McNair, formerly assistant treasurer and secretary of the New Orleans (La.) Railway & Light Company, is now the active head of the engineering division of the United Gas & Electric Corporation.

Mr. W. B. Malone, of the Montgomery (Ala.) Light & Water Power Company, has been appointed manager of the commercial department of the City Light & Traction Company, of Sedalia, Mo., as successor to Mr. J. E. Harsh.

Mr. J. W. Rutherford has resigned as manager of the new-business department of the Danbury & Bethel Gas & Electric Light Company, Danbury, Conn., to engage in consulting engineering work with an engineering organization in Newark, N. J.

Mr. Edwin N. Sanderson, of Sanderson & Porter, engineers and contractors, was on Jan. 19 elected president of the Federal Light & Traction Company, one of the large holding companies operating public utilities in various parts of the United States and having its principal place of business at 60 Broadway, New York City.

Mr. M. W. Offutt, until recently assistant to the vice-president and general manager of the Alabama Power Company of Birmingham, Ala., and at one time manager of the Schenectady (N. Y.) Illuminating Company, has been appointed general manager of the Porto Rico Gas Company, with headquarters in San Juan, Porto Rico.

Mr. C. G. MacAvoy, for several years superintendent of the Bellefonte (Pa.) Electric Company, will sever his connection with the company on Feb. 1. During the time Mr. MacAvoy has been connected with the company a change-over from night service to twenty-four-hour service has been effected and the business of the company has been almost doubled.

Mr. Edward Hammett has been elected general manager of the Sheboygan (Wis.) Railway & Electric Company. Mr. Hammett was formerly superintendent of railways under Mr. E. Gonzenbach, president and general manager, who, as announced in these columns on Jan. 10, 1914, withdrew from the company following the sale of the property to the Reiss interests.

Mr. S. F. Hazelrigg, for many years vice-president and general manager of the Richmond Light & Railroad Company, New Brighton, N. Y., has tendered his resignation, effective Feb. 1, and will devote his time to the Atlantic Coast Electric Light Company and other properties on the Jersey coast of which he is president. Mr. Hazelrigg has been connected with the Staten Island company since 1902, and in addition to being vice-president and general manager of the Richmond Light & Railroad Company he is vice-president and director of the Asbury Park & Sea Girt Railway Company, president and director of the Atlantic Coast Electric Light Company, president and director of the Atlantic Coast Electric Railway Company, president and director of the New Jersey & Staten Island Ferry Company, director of the Sea Coast Traction Company of Asbury Park, N. J., director of the Seashore Electric Railway Company, president and director of the Southfield Beach Railroad Company, president and general manager and director of the Staten Island & Midland Railway Company, and secretary, treasurer and director of the West End & Long Branch Railway Company. He is also connected with a number of industrial and banking institutions.

Mr. Shiras Morris, who has been secretary and treasurer of the Hart & Hegeman Manufacturing Company, Hartford, Conn., was elected president and treasurer of the company, succeeding the late A. H. Pease. Mr. Morris was graduated from Trinity College, Hartford, in 1896 and for a time did reportorial work on the *Hartford Courant*. He afterward entered the cost department of the Pope Manufacturing Company, and prior to his connection with the Hart & Hegeman Manufacturing Company was advertising agent for the Pope company. Two years after his connection with the Hart & Hegeman Manufacturing Company he was chosen secretary and two years after that assumed the additional duties of treasurer. Mr. Morris is also secretary and treasurer of the Kinsler-Bennett Company, vice-president of the Hartford Chapter of the National Association of Credit Men, treasurer of the Manufacturers' Association of Connecticut, and a member of the directorates of the American Industrial Bank & Trust Company, the Industrial Realty & Title Guarantee Company, the New England Sherardizing Company and the New Haven Sherardizing Company. He is a member of the Hartford Board of Trade, Hartford Business Men's Association, Hartford Club, University Club, Hartford Golf Club, Republican Club of Hartford, Board of Fellows of Trinity College and of the Jovian Order.

Mr. E. F. Sherwood was appointed chief engineer of the Eastern group of Bell telephone companies on Jan. 1. Mr. Sherwood became an operator in the office of the Law Telegraph & Telephone Company in New York City in January, 1879. This was the year in which the agreement was made between the Bell interests and the Western Union by which the latter was to leave the telephone field. On Aug. 1, 1880, the Metropolitan Telegraph & Telephone Company was formed, which in 1884 acquired the Law system. During these five years (1879-1884) Mr. Sherwood had been made manager of a branch office and later manager of the entire Law system. When that business was taken over by the Metropolitan Telephone & Telegraph Company Mr. Sherwood was placed in charge of the traffic department of the telephone company, which position he has held for the past thirty years. Mr. Sherwood's career is therefore inseparably linked with the development of the telephone business in New York. Under his guidance every advance from the substitution of girls for boys as operators to the present speed and precision in rendering telephone service to the public has been made. Problems of organization, equipment and operation and giving the public the best telephone service possible have all been handled by Mr. Sherwood with an ability which, with his long experience in the business, has earned for him the title of the Nestor of the traffic department, although he is still in the prime of life.

E. F. SHERWOOD

Construction

New England

FORT KENT, MAINE.—The Fort Kent El. Co. is contemplating extending its transmission line to the village of Soldier's Pond, a distance of 2 miles, in the spring. The company has also carried its lines across the St. John River into St. Clair, where it will furnish electrical service. Power for operating the plant is obtained from the Wallagrass River, 6½ miles from town. M. T. Billings is superintendent.

KEZAR FALLS, MAINE.—The Cornish & Kezar Falls Lt. & Pwr. Co., of Kezar Falls, has erected within the last six months a new concrete power house and installed two units of 190 hp each. The company has on hand one 150-kw and one 100-kw generator to be installed; also all accessories. Allen Garner is manager.

ALTON, N. H.—Within the next six months the Alton El. Lt. & Pwr. Co. expects to purchase material for distribution and lighting systems, including poles, wire, transformers and line material, lamps, etc. Raymond C. Duncan is manager.

KEENE, N. H.—The Laconia Gas & El. Co., of Keene, has just completed the installation of a 340-hp Leffell waterwheel directly connected to a 250-kw Allis-Chalmers generator. F. T. Brockington is superintendent.

PORTSMOUTH, N. H.—Within the next three months the Rockingham County Lt. & Pwr. Co., of Portsmouth, expects to install a 3500-kw .General Electric turbine. F. A. Belden is superintendent.

PITTSFORD, VT.—The Pittsford Pwr. Co., a subsidiary of the Rutland Ry., Lt. & Pwr. Co., has begun work on the construction of a 2000-hp hydroelectric power plant near Slab City in Chittenden County. The plant will be located between the Chittenden reservoir and the Rutland company's station at Mendon. A fall of 220 ft. will be utilized. A flume 7000 ft. long will be built in connection with this development. Electricity generated at the plant will be transmitted at 44,000 volts to Springfield, Vt., and Claremont, N. H. About one-third of the output will be sold to the Colonial Pwr. Co., and the remainder to the Rutland Pwr. Co.

SOUTH HADLEY FALLS, MASS.—At a special town meeting held Jan. 12 the citizens voted in favor of a municipal lighting system. It is proposed to take over the plant of the South Hadley Falls El. Lt. Co.

WESTFIELD, MASS.—Within the next three months the electric light committee expects to purchase one 500-kw turbine-driven alternator, one 300-hp boiler, economizer and condenser; also coal-handling machinery within the next six months. T. T. Logie is manager.

WORCESTER, MASS.—The Worcester El. Lt. Co., it is reported, will install another turbine, having a rating of 7800 kw, at its plant, to cost about $125,000. Plans are being prepared by Henry R. Kent and will include an addition to the building for the installation of the turbine and other machinery, which will include a new feed water pump. The company will soon ask for bids for the installation of nearly 400 luminous arc lamps, under the new agreement with the city.

MERIDEN, CONN.—The Board of Aldermen has granted the Meriden El. Lt. Co. permission to lay underground conduits in the business district. The present plans provide for laying about 1½ miles of conduits, at a cost of about $50,000.

Middle Atlantic

AFTON, N. Y.—The Public Service Commission has authorized the Afton-Windsor Lt., Ht. & Pwr. Co. to issue $60,000 in bonds, the proceeds to be used for the construction of a hydroelectric power plant. The company proposes to furnish electrical service in the towns of Afton, Colesville and Windsor.

AURORA, N. Y.—Within the next six months the Aurora El. Lt. Co. expects to purchase about 1000 incandescent lamps. N. L. Zabriskie is manager.

BUFFALO, N. Y.—Bids will be received at the office of the Department of Public Works, Room 5, Municipal Building, Buffalo, until Jan. 31 for an auxiliary 30-ton electric traveling crane at the Porter Avenue pumping station. Plans and specifications can be seen and printed forms of proposals obtained at the Bureau of Water. Francis G. Ward is commissioner.

DEERFIELD, N. Y.—The Town Board has accepted the proposal submitted by the Utica Gas & El. Co., of Utica, for lighting the streets of the town for a period of five years. The contract calls for about 50 street lamps.

DELHI, N. Y.—The Delaware El. Lt. & Pwr. Co., of Delhi, expects to purchase within the next eight months one 120-kw, single-phase, 60-cycle, 1150-volt generator. J. W. Hackney is manager.

EAST HAMPTON, N. Y.—Within the next six months the East Hampton El. Lt. Co. expects to erect 5 miles of transmission lines (probably subsurface) and to purchase 6 miles of underground conduit and wire. N. N. Tiffany is general manager.

FRANKLIN, N. Y.—The Delaware & Otsego Lt. & Pwr. Co., of Franklin, expects to purchase material for distribution system, including wire, meters, transformers, etc.; also incandescent lamps and electrical appliances and supplies. E. A. Mackey is manager.

GARDEN CITY, N. Y.—The Garden City El. Co. expects to purchase within the next two months cable, wire, meters, etc. (small amounts only to cover natural growth of system). Herbert L. Hatch is superintendent.

GENEVA, N. Y.—The Central New York Gas & El. Co., of Geneva, has applied to the Public Service Commission for permission to issue $50,000 in capital stock.

JAMESTOWN, N. Y.—The electric-light commission has accepted the recommendation of F. A. Shoemaker, of Buffalo, engineer, and will advertise for bids for the entire equipment recommended, which will include two stokers, two new steel stacks and a new 200-hp boiler.

MIDDLETOWN, N. Y.—Within the next two months the Orange County Ltg. Co., of Middletown, expects to erect a 1000-hp Cochrane feed-water heater, M. T. Davidson boiler-feed pump, with piping, etc., for which contracts have already been placed. Laurent Heaton is manager of the electrical department.

NEWARK VALLEY, N. Y.—Robert F. Chamberlain, of Cornell University, Ithaca, has been engaged to prepare plans for the municipal electric-light plant. It is proposed to install a steam-driven plant with an output of from 35 kw to 50 kw, 2200 volts, three-phase, 60 cycles.

ONEONTA, N. Y.—Within the next three months the Oneonta Lt. & Pwr. Co. expects to purchase a 250-hp engine and boiler. G. A. Lane is general manager.

POUGHKEEPSIE, N. Y.—Plans are being considered by the committee on municipal lighting for building an addition to the pumping station and installing additional dynamos and boilers, using this station as a municipal lighting plant to furnish electricity for lighting all the municipal offices and streets of the city. The cost of the plant is estimated at about $5,000.

RANDOLPH, N. Y.—Within the next six months the Randolph El. Lt. & Pwr. Co. expects to erect 13 miles of 6600-volt transmission line to furnish electricity in the villages of Rutledge, Conewango and Cherry Creek, and to farmers residing along the line; also to purchase 500 poles (from 30 ft. to 35 ft.) and fixtures for same, including 1500 6600-volt insulators, pole-top brackets and arms, constant-current, series street-lighting equipment for 50 to 75 5.5-amp. 60-cp tungsten lamps, and approximately 50 pole-type fixtures for same. The company will establish a 24-hour service about March 1 and now has contracts for approximately 75 hp in motors. Woodworth & Grace are proprietors.

SYRACUSE, N. Y.—The extension of the ornamental street-lighting system will be included in the contract awarded to the Syracuse Ltg. Co. for five years from July 1, 1913. The ordinance recently passed by the Council provides for 378 additional lamps.

WARSAW, N. Y.—Within the next six months the Warsaw Gas & El. Co. expects to purchase material for distribution system, including conduit, wire, arms and insulators. C. W. Torrey is manager.

WARWICK, N. Y.—The Warwick Valley Lt. & Pwr. Co. has applied to the Public Service Commission for permission to construct and operate an electric-light plant and for approval of franchise to supply electricity for lamps and motors in Warwick.

WEST WINFIELD, N. Y.—Application has been made to the Public Service Commission by L. B. & C. G. Seniff, of West Winfield, for permission to construct and operate an electric-light plant in West Winfield.

MEDIA, PA.—Specifications are now being prepared for an additional engine and generator for the municipal electric-light and water plant; also for a water pump of about 1,000,000-gal capacity. Patrick E. Ahern is superintendent.

PHILADELPHIA, PA.—The contract for the installation of engines, generators, switchboard and entire electric equipment in the addition to the Ritz-Carlton Hotel, Broad and Walnut Streets, Philadelphia, has been awarded to the United El. Construction Co., 1727 Sansome Street, Philadelphia. The work will involve an expenditure of more than $70,000. Horace Trumbauer is architect.

TULLYTOWN, PA.—The Borough Council has granted the East Pennsylvania Gas & El. Co., of Bristol, a franchise to erect transmission lines in Tullytown.

WASHINGTON, PA.—Bids, it is reported, are being asked by the Relief El. Lt., Ht. & Pwr. Co. for the construction of a brick and steel fireproof building (50 ft. by 90 ft.), plans for which may be obtained of Robert P. Reed, of Washington. The company proposes to furnish electricity in Washington and Canonsburg.

ALLENTOWN, N. J.—During the year 1914 the Water Department expects to build a retaining basin at the power house for use of the water department. Charles S. Joiner is superintendent of Municipal Electric Light Department.

CAMDEN, N. J.—The City Council has awarded the Public Service El. Co. a contract to furnish electric arc lamps and incandescent lamps and gas lamps for street-lighting in Camden for a period of five years.

ELIZABETH, N. J.—The Broad Street Improvement Association is negotiating with the street-lighting committee of the City Council for the installation of new street lamps on Broad Street, providing for an ornamental street-lighting system.

ELMER, N. J.—The Borough Council is considering the installation of an electric-street-lighting system in Elmer.

ORANGE, N. J.—Plans are being considered by the water and street lighting committee of the Common Council for extensions to the municipal electric-light plant and distributing system, to cost about $13,000. Henry Berg is chief engineer.

TRENTON, N. J.—The Ewing Township committee is planning for the installation of a street-lighting system on East Clinton Avenue and Hutchinson's Road. The installation will be made by the Pub. Ser. El. Co.

TUCKAHOE, N. J.—The Tuckahoe Lt. & Fuel Co. has been granted permission by the Board of Utility Commissioners for the installation of a new lighting system along certain highways of the county.

WILDWOOD, N. J.—An entire new lighting system will be installed on the boardwalk in the Second and Third Wards, replacing the incandescent lamps. Ornamental standards carrying five-lamp clusters will be erected.

LOGAN, W. VA.—Plans are being prepared by the Ohio Valley Co. for the installation of steam generating plant in Logan, to have an ultimate output of 20,000 hp. The initial installation will provide for 5000 hp. R. R. Livingston, 2 Rector Street, New York, N. Y., is engineer in charge.

WHEELING, W. VA.—The County Commissioners have granted the Brooke El. Co. of Brooke County a 30-year franchise to erect electric transmission lines over four roads of the county to furnish electricity for lamps and motors.

BROADWAY, VA.—At an election held recently the citizens voted to issue $5,000 in bonds to establish a municipal electric-light plant.

WILLIAMSBURG, VA.—The City Council is considering the question of establishing a municipal electric-light plant in Williamsburg.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Feb. 10, for furnishing at the various navy yards and naval station supplies as follows: Brooklyn, N. Y., Schedule 6285—1790 ft. single-conductor cable; Schedule 6290—200 angle-steel reflectors. East and West, Schedule 6290—300 desk lamps, type K. Lake Denmark, N. J., Schedule 6294—one duplex horizontal pump. Portsmouth, N. H., Schedule 6283—one motor-driven tumbling barrel, one motor-driven core cutting-off and coning machine, one motor-driven core wire straightening machine. Applications for proposals should designate the schedule desired by number. T. J. Cowie is paymaster general, U. S. N.

WASHINGTON, D. C.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Feb. 17 for furnishing at the various navy yards and naval stations the following supplies: Brooklyn, N. Y., Schedule 6301—7510 ft. interior communication cable, four 2-kw transformers; Schedule 6296—furnishing and installing one storage battery car, complete. Annapolis, Md., Schedule 6298—four drawbridge brass lamps, red and green (fitted for electricity),

eight brass lanterns with red lenses (fitted for electricity). Mare Island, Cal., Schedule 6292—75 electric flash lamps. Eastern yards, Schedule 6301—200 portable telephone testing sets. Norfolk, Va., Schedule 6302—switchboards and spare parts, miscellaneous telephones, etc.

North Central

BAY CITY, MICH.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Feb. 11, for conduits, etc., for the United States public building at Bay City, Mich. For further information see proposal pages. O. Wenderoth is supervising architect.

BELDING, MICH.—Bids will be received by the Spencer El. Co., of Belding, Mich., until March 5 for rebuilding its Smyrna water-power plant and penstocks in concrete, involving about 525 cu. yd. of reinforced concrete, 9 tons of structural steel and 8 tons of reinforcing steel. Plans may be seen at the office of the company at Belding, or at the office of the Fargo Engineering Co., Commonwealth Building, Jackson, engineer. Work will be started about May 15.

BIG RAPIDS, MICH.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Feb. 28, for the construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Big Rapids, Mich. Drawings and specifications may be obtained at the above office or from the custodian of site at Big Rapids. O. Wenderoth is supervising architect.

DURAND, MICH.—The board of electric light commissioners expects to purchase within the next 12 months one 125-kva to 177-kva, three-phase, 60-cycle, 1100/2200-volt generator, directly connected to a four-valve non-releasing Corliss engine, and from 18 to 22 lamp-posts for five-lamp clusters (center lamp vertical and four lamps inverted). H. F. Rosenkrans is superintendent.

EAST LANSING, MICH.—Plans are being considered for the installation of a new municipal street-lighting system.

GREENVILLE, MICH.—Bids will be received by the R. J. Tower El. Co., Greenville, until March 4, for furnishing labor and certain material for constructing concrete spillway and penstocks to remodel its present hydroelectric plant in Greenville. Concrete approximately as follows: In spillway, 800 cu. yd.; in penstocks, 1000 cu. yd. Company is to furnish structural steel; contractor to erect ready for riveting, which company will do, 68,000 lb. The company will furnish 35 tons of 6-in. U. S. 11-lb.-per-ft. sheet piling, which may be used for temporary work during construction. The company furnishes all structural steel, reinforcing steel, castings, turbines, electrical equipment and erection equipment. The Fargo Engineering Co., hydraulic engineer, Commonwealth Building, Jackson, Mich., has charge of the work.

MARQUETTE, MICH.—The Light and Power Commission expects to expend within the next 12 months about $25,000 for electrical supplies and appliances. C. Retallis is superintendent.

MUNISING, MICH.—The Munising Paper Co. is installing at its plant one 26-in. by 42-in. Allis-Chalmers horizontal simple Corliss engine directly connected to 400-kw alternating-current generator, together with all necessary auxiliary equipment to operate this unit with the present units in the plant. L. B. Steward is general manager.

OTSEGO, MICH.—The village of Otsego is considering the question of rebuilding the present lighting system or installing a complete new system. Electricity for operating the system is purchased from the Commonwealth Pwr. Co., of Jackson. W. G. Conlan is village clerk.

WHITEHALL, MICH.—The Board of Public Works expects to purchase within the next few months one feed pump and a carload of poles. E. Nelander is superintendent.

CLEVELAND, OHIO.—Legislation authorizing an issue of $800,000 in bonds for the completion of the municipal electric-light plant has been introduced into the City Council.

COLUMBUS, OHIO.—Extensive additions and improvements will be made to the plant of the Scioto Stone Co., work on which, it is said, will begin immediately. The company has closed contracts with the Columbus Rv. & Lt. Co. for electricity to operate its plant throughout.

COLUMBUS, OHIO.—Bids will be received by S. A. Kinnear, director of public service, Columbus, Ohio, until Jan. 28, for furnishing lamps as follows: 1800 40-watt, 118-volt gem lamps, 400 80-watt, 118-volt gem lamps, 200 25-watt, 118-volt Mazda lamps, 300 60-watt, 118-volt Mazda lamps, 700 40-watt, 118-volt Mazda lamps, 1600 100-watt, 112-volt Mazda lamps, 100 250-watt, 112-volt Mazda lamps, 200 100-watt, 118-volt Mazda lamps, 600 250-watt, 118-volt Mazda lamps, 25 150-watt, 118-volt Mazda lamps, 1800 60-cp, 6.9-amp Mazda series street lamps, 1100 100-sp, 6.9 amp Mazda series street lamps, 50 60-cp, 4-amp Mazda series street lamps, 15 80-cp, 5.5-amp Mazda series street lamps, 50 100-cp, 5.5-amp Mazda series street lamps, 15 80-cp, 4.2-amp Mazda series street lamps; 135 dozen 12-in. by 6-in. opal globes for cluster lamps, 45 dozen 16-in. by 8-in. opal globes for cluster lamps; 200 dozen Western Electric inner globes, 25 dozen Westinghouse Electric inner globes, 5 dozen Westinghouse Electric outer globes and 25 dozen Western Electric outer globes for arc lamps; 10 barrels of cylinder oil, 30 barrels of engine oil, 20 barrels of turbine oil and 1500 barrels of waste oil; 50,000 ½-in. by 12-in. cored carbons, 50,000 ½-in. by 12-in. solid carbons. Proposals to be made upon blank forms obtained from director of public service and the superintendent of the Department of Lighting, Dublin Avenue, Columbus, where copies of specifications may be obtained.

DAYTON, OHIO.—The Ottawa-Dayton Wtr. Pwr. Co., recently incorporated for the development of the water-power properties along the Fox River Valley, has made arrangements with the Illinois & Michigan Canal Commission relative to the development of power at Dayton. Simpson Brothers, who are among the incorporators of the company, have a developed water-power at Oswego and Yorkville and have negotiated for riparian rights on the Fox River between Wedron and Ottawa. It is proposed to erect a dam at Dayton and to utilize the power to generate electricity to furnish electrical service in the towns in the Fox River Valley.

ORRVILLE, OHIO.—Bids will be received at the office of the Board of Public Affairs, Orrville, until Jan. 28, for furnishing material and labor for the erection of an addition to the water-works station and the construction of a brick or concrete stack; also for furnishing steam and electrical machinery, electric street-lighting fixtures, material and supplies, etc. For details see proposal pages. W. R. Cook is clerk.

PIQUA, OHIO.—Wernette, Bradfield & Mead, architects and engineers, of Grand Rapids, have been awarded the contract to install a new power plant and heating system in the factory of the French Oil & Machinery Co. in Piqua.

PIQUA, OHIO.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Feb. 27, for the construction, complete, including mechanical equipment and approaches, of the United States post office at Piqua. Drawings and specifications may be obtained from the above office or from the custodian of site at Piqua. O. Wenderoth is supervising architect.

SHERWOOD, OHIO.—The Board of Public Affairs expects to install a 72-in. by 16-ft. tubular boiler in the municipal electric-light plant this summer; also a Simms feed-water heater and boiler-feed pump. G. W. Woodworth is manager and engineer of the municipal electric-light plant.

ERLANGER, KY.—The Board of Trustees has closed a contract with the Union Lt., Ht. & Pwr. Co., Covington, Ky., to furnish electricity for lamps and motors in Erlanger. The transmission line is being extended from Fort Mitchell.

HARLAN, KY.—The mine owners, it is reported, are considering the establishment of a co-operative power plant. It is proposed to locate the plant in Harlan and transmit electricity to the mines in Harlan County and adjacent fields.

JEFFERSONTOWN, KY.—The installation of a street-lighting system is under consideration, bids for which will soon be asked for. Dr. D. A. Floore is chairman of board of trustees.

JENKINS, KY.—The Consolidated Coal Co., of Baltimore, Md., will erect 150 miles of transmission line in eastern Kentucky and furnish electricity for lamps and motors within a radius of 60 miles of Jenkins. Owing to the increasing demand for electrical service it has become necessary to increase the output of the Jenkins power plant from 5000 kw to 10,000 kw. D. A. Maurer, of Jenkins, is construction engineer.

LA CENTER, KY.—The installation of a municipal electric-light plant in La Center is reported to be under consideration.

LEXINGTON, KY.—The City Council is considering an ordinance requiring public service companies to place their wires in underground conduits in the business district.

PADUCAH, KY.—The Board of Public Works has asked the City Council for an appropriation of $16,500 for the municipal electric-light plant.

PRINCETON, KY.—The Princeton Lt. & Pwr. Co. expects to purchase within the next two months one 150-hp horizontal tubular boiler and one 100-kw, three-phase, 60-cycle, 2300-volt alternator. W. J. Holman is manager.

HANOVER, ILL.—The contract for installing the municipal electric-light plant in Hanover has been awarded to the Joseph Chandler Co., of Rockford, Ill.

MELVIN, ILL.—We are informed that the Central Illinois Pub. Ser. Co., of Mattoon, has not been granted a franchise in Melvin, as reported in the issue of Jan. 10. E. Graham is assistant general superintendent.

TOWER HILL, ILL.—The installation of a municipal electric-light plant in Tower Hill is under consideration. The Central Illinois Public Service Co., of Mattoon, now furnishes electrical service here.

WAUKEGAN, ILL.—M. J. Douthitt, city engineer, writes that nothing definite has yet been decided upon in regard to the proposed ornamental street-lighting system. Probably 150 standards, carrying single or cluster lamps, maintained by underground wires, will be erected. Contracts for the work will probably be awarded in the spring.

ALTOONA, WIS.—The Chippewa Valley Ry., Lt. & Pwr. Co., of Eau Claire, is reported to have been granted a franchise to operate in Altoona.

MANITOWOC, WIS.—Contracts have been awarded by the Oslo Pwr. Co., of Manitowoc, for rebuilding its large dam in Oslo to Orbison & O'Keefe, of Appleton The capital stock of the company has been increased from $5,000 to $25,000. The company furnishes electricity for lamps to several villages, including Clarks Mills, Whitelaw, Valders, St. Nazianz; also for the county sanitorium at Whitelaw. The company will also furnish power in Manitowoc. A. O. Anderson is president and manager.

MILWAUKEE, WIS.—The City Council is considering the question of installing new street lamps in the outlying districts, which will involve an expenditure of $16,000. A resolution has been recommended to the Council finance committee which favors an appropriation of $5,000 to provide funds for a survey of the city for a new electric-lighting system.

ANNANDALE, MINN.—The Annandale El. Lt. & Pwr. Co. expects to purchase within the next six months a new generator and oil engine. G. G. Sawyer is manager and purchasing agent.

ANOKA, MINN.—Bids will be received by the board of armory supervisors, State of Minnesota, at the office of the secretary, 604 Pioneer Building, St. Paul, until Feb. 9, for construction of an armory building for Company B, Third Regiment Infantry, Minnesota National Guard. Separate bids to be submitted for general contract, heating, plumbing and electric work. Plans and specifications are on file at the Builders' Exchanges in St. Paul and Minneapolis and can be obtained at the office of Alden & Harris, architects, 809 Commerce Building, St. Paul, upon deposit of $10, which will be refunded upon return of same.

DULUTH, MINN.—The Great Northern Pwr. Co., of Duluth, within the next eight months expects to install a new generating unit, consisting of a 15,000-hp waterwheel (I. P. Morris Co.) and a 12,000-kva General Electric generator and transformer. This unit will have a vertical shaft and will give the station a total output of 45,000 kva. Contracts have also been placed for a new penstock. W. M. Ryeson is general manager.

HARDWICK, MINN.—Within the next three months the managers of the municipal electric-light plant expect to purchase lamps and other supplies needed for the plant. J. H. Mathison is superintendent of the municipal plant and J. B. Iversan is village recorder.

INTERNATIONAL FALLS, MINN.—Bids will be received by P. H. Fogarty, clerk of Board of Education, International Falls, until Jan. 29 for furnishing and installing electric-light fixtures for the high school building, in accordance with plans and specifications prepared by Tyrie & Chapman, architects, Auditorium Building, Minneapolis. Plans are on file at the office of the clerk of Board of Education and at the office of the architects.

KITZVILLE, MINN.—The Village Council has granted the Chisholm El. Co., of Chisholm, a franchise to furnish electricity for lamps and motors here; also a contract for street-lighting. Through error this was published under Kitzville, Mich., in the issue of Jan. 17. Kitzville has not a post office.

SHERBURN, MINN.—Within the next 30 days the Board of Public Works expects

to purchase one second-hand Duncan 5-amp wattmeter; also within the next six months one boiler pump for 100-hp boiler; also to erect a cement block building for storage battery and to purchase a 50-amp, eight-hour storage battery with booster (118 cells) within the next 10 months. G. Fabianke is superintendent.

DE WITT, IA.—Within the next six months the De Witt El. Lt. & Pwr. Co. expects to purchase two 100-hp boilers, 150-lb. pressure, with stokers. John M. Reichart is proprietor and manager.

SIBLEY, IA.—Bonds to the amount of $18,000 have been voted for the establishment of a municipal electric-light plant. Steps, it is said, will be taken immediately for the installation of the plant.

VOLGA, IA.—O. Weisner, recently granted a franchise to furnish electricity in Volga, is now erecting a plant. The equipment of the plant will consist of a 30-hp Davis gasoline engine, one 35-hp McCormack waterwheel, Lombard governor (to be installed), one 50-kw Westinghouse three-phase, alternating-current generator, one switchboard with instruments, one 15-kva, one 10-kva and one 7½-kva transformer. About 70 white cedar poles and 2 miles of wire will be required for distribution system. Westinghouse meters will be used (none installed as yet).

WILLIAMSBURG, IA.—Frank Gue, of Keota, has purchased the street-lighting franchise voted to the local canning company; also part of the company's buildings and lot, on which he proposes to erect an electric power plant to furnish electricity in Williamsburg. Later the system will probably be extended to Conroy and Parnell.

ELDON, MO.—Within the next six months the Eldon Lt. & Pwr. Co. expects to purchase material for street-lighting system, consisting of 100 lamps. The company would like to receive estimates on this equipment. N. E. Harvey is president.

FESTUS, MO.—Within the next three months the board of electric light commissioners expect to purchase one 175-hp, 150-lb.-pressure, horizontal tubular boiler. C. J. Davidson is city clerk.

GLASGOW, MO.—The electric light commissioners expect to install within the next two months one 50-kva, three-phase, 60-cycle, 2300-volt generator directly connected to a 12-in. by 12-in. engine and switchboard panel, contracts for which have already been placed. R. L. Blacet is superintendent.

MOUNTAIN GROVE, MO.—Within the next six or eight months the Mountain Grove Ice & El. Co. expects to purchase about 2000 ft. of copper wire; also within the next few months to purchase one or two boilers. C. B. Walker is manager.

ST. CHARLES, MO.—The City Council has passed an ordinance granting permission to the St. Charles El. Lt. & Pwr. Co. to furnish electricity in St. Charles.

ST. JOSEPH, MO.—Within the next four months the city of St. Joseph expects to purchase about 2500 lb. of No. 8 weatherproof wire for extending arc lamp circuits. A. L. Utz is superintendent.

ST. LOUIS, MO.—The Board of Public Improvements has granted the Phœnix Lt. & Pwr. Co. (a subsidiary of the Laclede Gas Lt. Co.), and the St. Louis Lt. & Development Co. permits to place conduits and ducts on Washington Avenue between Fourth and Eighth Streets.

MINNEWAUKON, N. D.—Bids will be received by W. E. Paulson, county auditor, Minnewaukon, until Feb. 3, for installing an electric-light plant in the court house, also a set of storage batteries, chandeliers, switches, lamps, globes, etc.

SHERWOOD, N. D.—The installation of an electric-light plant in Sherwood next summer is reported to be under consideration. C. H. Budke is interested.

WILLISTON, N. D.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until March 9 for construction complete, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Williston, N. D. Drawings and specifications may be obtained from the above office or from the custodian of site at Williston. O. Wenderoth is supervising architect.

SALEM, S. D.—A movement has been started to have the transmission line of the Salem Milling, Lt. & Ht. Co. extended from Salem to Spencer to furnish electrical service there.

WINFRED, S. D.—The installation of an electric-light plant in Winfred is under consideration. M. A. Chapin and others are interested.

ADAMS, NEB.—Within the next 10 months the Adams El. Lt. Co. expects to erect 8 miles of transmission lines to supply electricity to another town; also to purchase an additional generator, one supply pump, poles, transformers, insulators, lightning arresters for 8 miles of transmission lines in addition to the needs of the town, and supplies for lighting system to meet ordinary demands. John Sheffler is proprietor.

ANSELMO, NEB.—Application has been made to the Village Board by David Christen for a franchise to construct and operate an electric-light plant in Anselmo.

AUBURN, NEB.—The city of Auburn is planning to install an ornamental street-lighting system in the spring. Present plans provide for 65 ornamental posts. G. E. Johnson, of Falls City, is engineer in charge.

BLOOMINGTON, NEB.—At an election held recently the proposal to issue $8,500 in bonds for the installation of an electric-lighting system was carried.

BRISTOW, NEB.—Bids will be received by Alvin Olson, city clerk, until Jan. 26 for the construction of an electric-light plant. Bruce & Standevin, Bee Building, Omaha, are engineers.

CENTRAL CITY, NEB.—Within the next three or four months the board of light commissioners expects to purchase a 200-kw, three-phase, 60-cycle, 2300-volt generator, with slow-speed engine, directly connected. Leonard Anderson is light commissioner.

FALLS CITY, NEB.—The city of Falls City expects to rewire the municipal electric-light system, at a cost of about $5,000. The city also is planning to extend its transmission lines to Roulo, Neb., and Mound City, Mo., where it will furnish electricity for lamps and motors. G. E. Johnson, manager of the municipal electric-light plant, has charge of wiring both towns for electrical service.

HUMBOLDT, NEB.—Within the next six months O. A. Cooper & Son, owners of the local electric-light plant, expect to overhaul the entire distribution system (rebuild portions and improve the entire system), for which most of the material has been purchased. Also to purchase some heating and cooking devices, watthour meters and a general line of wiring supplies. H. P. Galliher is superintendent.

KEARNEY, NEB.—The City Council is considering two proposals for lighting the city—one to install a distribution system and secure electricity from the local company to operate it; the other to install an entire new municipal electric-light plant. The franchise of the local company ran out last spring and the Council refused to renew it.

OSCEOLA, NEB.—Within the next 12 months the managers of the Osceola & Shelby electric light, heat and power plant expect to purchase electrical appliances and supplies as demands require.

ARKANSAS CITY, KAN.—Plans are being prepared, it is reported, by Burns & McDonnell, Scarritt Building, Kansas City, Mo., for improvements to the electric-light and water-works systems, to cost approximately $75,000.

ARMA, KAN.—The contract for the construction of an electric-light plant and water-works system is reported to have been awarded to the Commercial Construction Co., Reliance Building, Kansas City, Mo. A. C. Moore, Barlett Building, Joplin, Mo., is engineer.

HERRINGTON, KAN.—At an election held Jan. 8 the proposal to issue $49,000 in bonds for extensions to the municipal electric-light plant and water-works system was carried. The City Council has engaged the Benham Engineering Co., of Oklahoma City, Okla., to prepare plans and specifications. The work will consist of development of a new water supply from springs, a 10-in. supply line, pumping machinery, extensions of mains in city, and an additional generating unit in the electric-light plant.

LE ROY, KAN.—Preparations are being made by the City Council for the sale of bonds ($13,000) which were recently voted for a municipal electric-light plant. As yet nothing definite has been done, but it is expected that work on construction of the plant will begin sometime in February. E. T. Archer & Co., New England Building, Kansas City, Mo., are engineers in charge Harry L. Covert is city clerk.

QUENEMO, KAN.—The municipal electric-light plant was recently destroyed by fire, causing a loss of about $6,000. It has not been decided as yet whether the plant will be rebuilt.

Southern States

CHARLOTTE, N. C.—The Southern Pwr. Co., of Charlotte, is reported to have decided to develop Lookout Shoals waterpower, the dam (fifth of the company) to be 80 ft. high.

LONG ISLAND, N. C.—Plans, it is reported, are being considered by the Long Island Cotton Mills for the construction of a hydroelectric power plant at Buffalo Shoals, above Long Island. The present plans provide for a concrete dam 10 ft. to 18 ft. high, to develop from 1500 hp to 2000 hp. The company has options on right-of-way for 2 miles of transmission line.

ST. GEORGE, S. C.—The City Council is reported to have awarded contract for the installation of an electric-light plant and water-works system to the Modern Equipment Co., of Savannah. The plant will be driven by oil engines.

COOLIDGE, GA.—The electric plant of the Coolidge El. Lt. Co. was destroyed by fire recently.

WAYCROSS, GA.—The Hebard Cypress Co., it is reported, is contemplating the construction of an electric light and power plant.

ARCADIA, FLA.—Bids will be received by board of public instruction of De Soto County, addressed to James O. Bickley, superintendent of public instruction, Court House, Arcadia, Fla., until Feb. 16, for construction of high school building, complete, including electrical work, plumbing, etc. Plans and specifications are on file at the office of the superintendent, Court House, Arcadia, and at the office of Francis J. Kennard, architect, American National Bank Building, Tampa, Fla., where copies of plans may be obtained upon deposit of $25, to be refunded upon return of same.

MARYVILLE, TENN.—The Aluminum Co. of America, which is establishing a plant at Maryville, it is reported, will secure electricity for operating its works from the plant of the Tennessee Pwr. Co., of Cleveland, Tenn., located on the Ocoee River. The Aluminum Co., it is understood, will install a power plant for emergency purposes.

BOONEVILLE, MISS.—Within the next six months the Booneville Water Works Co. expects to install a 10-ton ice plant in connection with its present light and water plants. A. W. Kearly is general manager.

CANTON, MISS.—Within the next two or three months the water and light commissioners expect to purchase one 160-hp high-speed automatic engine, one belt-driven centrifugal pump having a capacity of from 300 gal. to 400 gal. per minute, and one 350-cu. ft. air compressor (belt driven). John T. Sharp is superintendent.

WINONA, MISS.—Within the next two months the Winona Wtr., Sewerage, Ice & Lt. Co. expects to purchase a small quantity of electrical appliances and supplies (staples). W. H. Harvey is president and manager.

CAMDEN, ARK.—The property of the Camden Pwr. Co., consisting of electric-light and power plant and water-works system, has been purchased by the Arkansas Pwr. Co., recently incorporated. H. C. Couch, of Little Rock, is president of the Arkansas company.

SEARCY, ARK.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Feb. 28, for the construction, including mechanical equipment, interior lighting fixtures and approaches, of the United States post office at Searcy, in accordance with drawings and specifications which may be obtained at the above office or from the custodian of site at Searcy. O. Wenderoth is supervising architect.

SINGER, LA.—Dr. J. W. Brown, it is reported, is contemplating the installation of an electric-light plant and ice factory.

PLEASANTON, TEX. — Improvements are being made to the plant of the Pleasanton Ice & El. Co., involving an expenditure of about $5,000. New machinery is being installed.

RUSK, TEX.—The capital stock of the Rusk Lt. & Pwr. Co. has been increased from $3,500 to $10,000.

SEGUIN, TEX.—We are informed that no definite action has yet been taken in regard to the proposed improvements to be made to the municipal electric-light and water-works plants as reported in the issue of Jan. 3. G. E. Smith is manager.

WACO, TEX.—Excavation work has been started on the new power plant of the Texas Pwr. & Lt. Co., in East Waco. The cost of the plant is estimated at $280,000.

Pacific States

BELLINGHAM, WASH. — The Skagit Pwr. Co., controlled by the Stone & Webster Corpn., of Boston, Mass., which is planning to develop water-power properties on the Skagit River, recently filed notices with the auditor of Whatcom County in Bellingham, for three locations as follows: One

19 miles above Marblemouth, one at Canyon Diablo and the other below the mouth of Ruby Creek. All are for 500 cu. ft. of water per second.

DAYTON, WASH. — Preliminary plans are being prepared by Jacob Weinhard, of Dayton, it is reported, for the installation of an electric-light and heating plant here.

OLYMPIA, WASH.—The Washington Pub. Ser. Co., of Olympia, is reported to have granted a franchise to erect transmission lines through Olympia to Tenino and Grand Mound to furnish electricity for lamps and motors.

OLYMPIA, WASH.—The commissioners of Thurston County have granted the Washington Pub. Ser. Co., of Olympia, permission to erect and operate electric transmission lines throughout the county. The franchise is for a period of 50 years. The system will extend from Olympia to Gate, via Tenino and Grand Mound; electricity will also be furnished to smaller towns and farmers along the route.

SEATTLE, WASH.—The contract for the installation of cluster lamps on Fifth Avenue has been awarded to Dicken & Rightmire, 2738 Thirty-third Avenue, Seattle, at $12,279.

SEATTLE, WASH.—The bid of Hunt, Mirk & Co., for $139,000, which was the lowest submitted, for the complete electrical equipment for the municipal power plant substation, will probably be thrown out, owing to the bid being unsigned. Charles C. Moore & Co., Hoge Building, Seattle, submitted the next lowest bid, at $149,000. It is understood that new bids will be called for. A. L. Valentine is chairman of board of public works.

SEDRO-WOOLLEY, WASH.—Plans for the installation of a cluster-lamp lighting system on Metcalf Street, from State Street to the Great Western crossing, to cost $25,000, have been approved by the City Council and steps will be taken at once to install same. Electricity for maintaining the lamps will be furnished by the Pacific Northwest Trac. Co., of Sedro-Woolley.

SUMAS, WASH.—The Public Service Commission, it is reported, has instructed the Sumas El. Co. to make considerable improvements and alterations to its system.

HOOD RIVER, ORE.—The Odell Development League is reported to be considering the construction of a co-operative electric light and power plant on Hood River, near Odell. A committee, consisting of Mark Cameron, George Sheppard, Harry Connoway, R. E. Miller and J. E. Ferguson, has been appointed to make a canvass to procure stock subscriptions and to engage a hydraulic engineer to prepare estimates of the cost of the proposed plant.

MARE ISLAND, CAL.—Improvements are contemplated at the navy yard electric-light plant at Mare Island within the next 12 months, including the rebuilding of 1000 ft. of 2300-volt, three-phase transmission line: the erection of 5000 ft. of No. 6 insulated wire and 4000 ft. No. 2 insulated wire: also the purchase of one 500-kw motor-generator, one motor-driven speed regulator for 1000-kw Westinghouse-Parsons turbo-generator, eight multiple inclosed 5-amp arc lamps, 20,000 ft. National Electric Code wire, 6000 ft. rubber-covered wire, 10,000 ft. No. 14 rubber-covered, iron-twisted pair wire, 5000 ft. 15 or 20 pair insulated, lead-covered telephone cable: also, within the next 24 months, 5000 ft. 750,000-circ. mil. paper-insulated cable and 2500 ft. 500,000-circ. mil. paper-insulated cable. Captain F. M. Bennett is commandant.

SAN JACINTO, CAL.—The Southern Sierras Pwr. Co., of San Jacinto, is now erecting about 3 miles of transmission lines on 35-ft. poles. The company is continually extending its lines to reach new customers. George R. Kempton is local superintendent for the San Jacinto and Hemit territory.

BOISE, IDAHO.—The contract for installing electric wires and fixtures in the Elks' Building in Boise has been awarded to the Brigger-Hetherington Co., or this city, at $2,116.

LAPWAI, IDAHO. — The Lewiston-Clarkston Imp. Co., of Lewiston, has petitioned the City Council for a franchise to supply electricity for lamps and motors in Lapwai. If granted a franchise, the company will extend its transmission lines to this city and install a complete lighting system.

LEWISTOWN, IDAHO.—Residents of the Normal Hill district have petitioned the City Council for the installation of a street-lighting system in that section of the city.

GLASGOW, MONT.—The city of Glasgow has awarded a contract for the installation of a municipal electric-light plant, the equipment to include one 80-hp compound, tandem engine, one 50-kw, three-phase, 60-cycle, three-phase generator, with exciter, directly connected: an entire new switchboard with all instruments for control and operation of both units. The city will also install an ornamental street-lighting system. E. S. Severance is city engineer and A. J. Melvin is superintendent of municipal electric plant.

GLENDIVE, MONT.—The City Council has recently passed an ordinance providing for the installation of an arc-lamp lighting system on Merrill Avenue, to cost about $5,000. For further information address Elnar Rivenes.

LOVELOCKS, NEV.—Within the next six months the Lovelocks & Woolsey Lt. & Pwr. Co., of Lovelocks, expects to erect 4 miles of three-phase transmission line and to purchase one 150-kw, three-phase, 2400-volt generator, one 200-hp water turbine, waterwheel governors for two turbines (one 75-hp and the other 200-hp), 100 5-amp and 10-amp meters, (60-cycle, single-phase, 110-volt), one carload of 35-ft. poles; also material for street-lighting system for arc and tungsten lamps, and electrical appliances and supplies, including heating and cooking apparatus, vacuum cleaners, washing machines, wiring supplies, switches, etc. C. L. Yung is manager.

Canada

HEDLEY, B. C.—Plans prepared by A. J. Matheson, of Cartwright, Matheson & Co., of Vancouver, for the construction of a dam across the Similkameen River at Hedley, it is reported, have been accepted by the Daly Reduction Co., of Hedley. The plans provide for a dam 200 ft. long, developing 18,000 hp; the flume will be 1500 ft. long with 60 ft. head of water. The total cost of the work is estimated at about $200,000.

KAMLOOPS, B. C.—The city of Kamloops, it is understood, will begin work on construction of the proposed municipal hydroelectric plant as soon as the weather will permit.

BRIGDEN, MAN.—A by-law has been passed by the ratepayers authorizing an expenditure of $4,000 for the installation of an electric-light plant.

LE PAS, MAN.—The ratepayers have passed a by-law authorizing an appropriation of the necessary funds for the installation of an electric-lighting system.

ROCKWOOD, MAN.—The Council has granted the Civic Light and Power Department of Winnipeg a franchise to furnish electricity for lamps and motors here. Rockford has not a post office.

CHIGNECTO, N. S.—Plans have been prepared by the Canada El. Co., of Amherst, for the installation of a 1000-kw turbo-generator set at its plant in Chignecto.

CREEMORE, ONT.—At an election held recently the ratepayers voted in favor of the by-law authorizing the town to contract with the Hydro-Electric Power Commission of Ontario for electricity.

HAMILTON, ONT.—At an election held recently the by-law authorizing an expenditure of $335,000 for extensions to the city's hydroelectric system was carried.

LARDER LAKE, ONT.—The D'Or Huronia Co., it is reported, is preparing plans for a water-power development in the vicinity of Larder Lake, which will enable them to operate its mine and mill on a larger scale.

PARK HILL, ONT.—The installation of an electrical distributing system in Park Hill is under consideration by the Council.

TORONTO, ONT.—Bids will be received by H. F. McNaughton, secretary of Public Works Department, Department of Public Works, Toronto, until Jan. 28, for steam heating, plumbing and electric wiring required in the following buildings: The reception hospital, Asylum for Insane, Brockville: court house at Fort Frances, court house at Haileybury, and for electric wiring only of the dining hall, Ontario Agricultural College, Guelph. Plans and specifications may be seen at this department, at the above institutions, Brockville and Guelph, and at the Sheriff's office in Fort Frances and Haileybury.

Miscellaneous

THORN ARM BAY, ALASKA.—Plans are being prepared for the construction of a 2000-hp hydroelectric station, 150-ton paper mill, 120-ton ground wood-pulp mill and 50-ton sulphite pulp mill at Thorn Arm Bay, Southeast Alaska, by W. C. Bigelow, architect and engineer, of Biddeford, Maine. Bids will be called for early in the spring.

PANAMA.—Bids will be received at the office of the general purchasing officer, Isthmian Canal Commission, Washington, D. C., until Feb. 7 for electric welding outfit, tinsmith's plate-bending roll, steel locker cabinets, etc. Blanks and general information relating to this circular (No. 823) may be obtained from the above office or from the assisting purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal. Major F. C. Boggs is general purchasing officer.

New Incorporations

BOSTON, MASS.—The Pittsfield Pwr. Co. has been granted a charter with a capital stock of $500,000. The directors are J. F. Moors, president; O. Clement Swenson, of New York, N. Y., treasurer; C. C. Davis, H. Nash, Jr., and F. E. Smith.

WALTHAM, MASS.—The Waltham El. Co. has been incorporated with a capital stock of $5,000 by Rufus B. Skinner, Grace B. Bowman and Lydia A. Brimmer.

ROSELAND, NEB.—The Roseland El. Lt. Co. has been incorporated with a capital stock of $10,000 by G. Boury and others.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED JAN. 13, 1914.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York, N. Y.]

1,083,926. MICROPHONE; L. Ericson, Chicago, Ill. App. filed Aug. 15, 1912. Combined receiver and transmitter.

1,083,937. LOCOMOTIVE SIDE FRAME; C. E. Lilley, Bluefield, W. Va. App. filed May 22, 1913. Electric locomotive side frame which may be readily adapted to various types of motor hangings.

1,083,941. CONTROL SYSTEM FOR ELECTRIC MOTORS; J. S. Peck, Manchester, Eng. App. filed Feb. 11, 1910. Connections effected by individual electromagnetically operated switches.

1,083,945. COOLING SYSTEM FOR TRANSFORMERS; K. C. Randall, Edgewood Park, Pa. App. filed Nov. 6, 1908. Cooling oil circulates through exterior cooling tubes which are surrounded by cooling medium.

1,083,950. CIRCUIT CONTROLLER; H. A. Steen, Milwaukee, Wis. App. filed Jan. 3, 1911. Elevator controller with one set of contact members governing direction of rotation of elevator motor and another set controlling resistance sections.

1,083,956. ELECTRIC SEAM-WELDING; E. Thomson, Swampscott, Mass. App. filed May 10, 1913. Spot-welds an overlapping seam and then forms a continuous weld by rollers which constitute electrodes.

1,083,959. AUTOMATIC WEIGHING APPARATUS; C. C. Voglesong, Oakland, Cal. App. filed Sept. 23, 1912. An electric motor reciprocates a feeding device.

1,083,964. ELECTRIC SPARK-PRODUCING APPARATUS; G. W. Wacker, New York, N. Y. App. filed Aug. 10, 1908. Battery causes windings on the armature of the magneto to produce a starting spark independently of the interrupter.

1,083,965. ENGINE-STARTING SPARK-PRODUCING APPARATUS; G. W. Wacker, New York, N. Y. App. filed Nov. 18, 1908. Armature winding of magneto employed as induction coil at starting.

1,083,971. Air Brake; G. B. Wolf, Smithville, Tex. App. filed May 25, 1911. Electric controlling device causes brakes to be set simultaneously on all cars of a long train.

1,083,979. Method and Apparatus for Separating Ores or the Like; O. A. Zander, Guldsmedshyttan, Sweden. App. filed June 14, 1912. Employs traveling concentric shelves of successively varying diameters.

1,083,992. Apparatus for Cleaning Articles; E. L. Couch, Hartford, Conn. App. filed Nov. 19, 1912. Anode in the form of a plate made of aluminum, tin and lead.

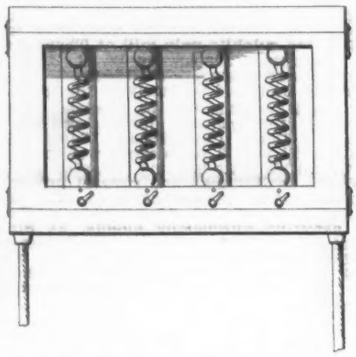
1,084,012. Device for Calling Cabs, Porters and the Like by Telephone; A. Hinzpeter, Munich, Germany. App. filed Aug. 12, 1912. Signaling apparatus remains locked until the call has been responded to.

1,084,040. Dynamo-Electric Machinery; A. L. J. Scherbius, Frankfort-on-the-Main, Germany. App. filed Sept. 7, 1906. Compensating winding for tri-phase commutating machines.

1,084,059. Signaling System; C. E. Beach, Binghamton, N. Y. App. filed April 9, 1912. Storage batteries included serially in the signaling circuit when the main source of current is operative so as to be kept fully charged for operation when main source is cut off.

1,084,060. Seal for Containing Cases; C. E. Beach, Binghamton, N. Y. App. filed June 4, 1912. Seals opening in the cover through which extends the operating handle for the fire alarm or other apparatus.

1,084,070. Loud-Speaking Telephone System; J. J. Comer, Chicago, Ill. App. filed Nov. 28, 1910. Heavy-current system in which provision is made for accurate adjustment.



1,084,397—Ignition-Indicating Device for Internal-Combustion Engines.

1,084,077. Reversing Switch; T. B. Elliott, Independence, Kan. App. filed April 10, 1911. Includes a swinging lever with conducting plates on its opposite faces.

1,084,078. System of Electrical Distribution; V. A. Fynn, London, Eng. App. filed March 16, 1910. Storage battery feeds consumption circuit when the variable-speed dynamo is at rest or driven at too slow a speed.

1,084,079. Dynamo-Electric Machine; V. A. Fynn, St. Louis, Mo. App. filed May 13, 1912. Machine has two shunt windings and a series winding for engine-starting and generator purposes.

1,084,083. Welding Machine; J. H. Gravell, Philadelphia, Pa. App. filed Feb. 24, 1913. Small-size portable device having terminals connected to the secondary coil and movable toward and away from each other.

1,084,100. Automatic Fire and Burglar Alarm; L. A. Meyers, Sauk Center, Minn. App. filed April 26, 1913. Telephone circuits and bells utilized for sounding an independent alarm in all the rooms of a hotel or other building.

1,084,104. Magnetic Break Switch; G. E. Palmer, Brookline, Mass. App. filed May 10, 1912. Multipolar switch with laminated contacts.

1,084,129. Method of Softening the Ends of Electrodes and Other Carbon Articles; J. W. Brown, Lakewood, Ohio. App. filed June 10, 1912. Graphitizes carbon with current of 5000 amp; for softening end of furnace electrode so that a threaded connection can be made.

1,084,147. Support for Electric Service Wires; G. Hopkins (deceased), Portland, Ore. App. filed Jan. 7, 1913. Semi-circular supports clamped on the insulator pin.

1,084,148. Device for Transmitting Force by Means of Magnetized Rings; A. Huggenin, Zurich, Switzerland. App. filed Sept. 6, 1911. Blades on the driving and driven members arranged to coincide in the rotation of the members.

1,084,150. Process of Electrolytic Production of Copper; N. V. Hybinette, Christiania, Norway. App. filed March 29, 1913. Passes an electrolyte containing large quantities of ferric salts into cathode compartment of electrolytic cell and circulates the solution through a filter from cathode to anode.

1,084,155. Tracing Device for Copying or Duplicating Machines; Emil R. Lochman, Boston, Mass. App. filed May 21, 1910. An electric circuit is completed when the tracing tool contacts with a master pattern at any point.

1,084,172. Trolley-Pole Retriever; T. B. Shananhan, Manlius, N. Y. App. filed Sept. 2, 1909. Has means for locking one end of the retriever spring to the retriever casing.

1,084,189. Telephone System; F. M. Wolf and R. M. Austin, Monroe, Wis. App. filed April 23, 1912. Removal of receiver from hook notifies exchange and the other persons upon the line.

1,084,192. Internal-Combustion Engine Comprising Rotating Cylinders; E. Becker and F. Dinslage, Charlottenburg, Germany. App. filed July 1, 1912. "Gnome" revolving-cylinder type with special ignition control.

1,084,199. Fireproof Electrically Conducting Bodies and Process of Manufacturing the Same; G. Egly, Berlin, Germany. App. filed Sept. 12, 1910. Fashions mass containing free silicon into a body and then causes said body to absorb carbon and oxygen.

1,084,206. Attachment for Mouthpieces; A. C. Gaynor, Bridgeport, Conn. App. filed Dec. 17, 1912. Annular disinfectant holder supported in front of telephone mouthpiece.

1,084,220. Apparatus for the Electric Lighting of Motor Cars and for Other Purposes; M. Metz, Coventry, Eng. App. filed Feb. 9, 1912. Combined electric distributer, single-pole or double-pole switch and "change-over" switch.

1,084,250. Method of Making Chain Links; F. G. Breul, Bridgeport, Conn. App. filed May 17, 1913. Electric weld made upon the crossed and overlapped ends of chain link.

1,084,274. Apparatus for Graphitizing Carbon; P. L. T. Heroult, New York, N. Y. App. filed Feb. 16, 1912. Broken carbon subjected to blast of air under such conditions that it is considerably heated and is then heated to graphitizing temperature electrically.

1,084,317. Electric Locomotive; W. Dalton, Schenectady, N. Y. App. filed Aug. 19, 1913. Friction devices interposed between truck frame and unit frames modify and reduce lateral vibration to negligible point.

1,084,318. Electric Locomotive; W. Dalton, Schenectady, N. Y. App. filed Aug. 19, 1913. Has locking means for converting a non-swiveling or trailing truck into an effective swiveling or leading truck.

1,084,328. Telephone Attachment; E. Gransaull, New York, N. Y. App. filed Nov. 27, 1912. Sound amplifier attached to the receiver.

1,084,351. Apparatus for Extracting Metals from Their Ores; H. S. MacKay, Riverside, Cal. App. filed Jan. 20, 1910. For converting copper sulphides, carbonates, oxides, etc., into metallic copper.

1,084,362. Lamp Support; H. C. Reagan, Philadelphia, Pa. App. filed March 17, 1913. Has relatively fixed and movable socket-carrying arms which receive the opposite ends of the tubular lamp bodies.

1,084,364. Windings for Electrical Machines; E. Rosenberg, Berlin, Germany. App. filed Jan. 17, 1907. Dynamo for divided circuits.

1,084,365. Constant-Output Generator; E. Rosenberg, Berlin, Germany. App. filed May 17, 1907. Armature current, as it increases, produces a proportionately greater effect than the same current in the field winding.

1,084,371. Winding Machine; C. B. Snell, Brookline, Mass. App. filed Feb. 3, 1913. For winding continuous wire in flat spiral layers, one against another, in alternately increasing and decreasing spirals.

1,084,379. Screwless Carbon Holder; W. W. Wile, Bluffton, Ind. App. filed Oct. 10, 1912. Cam-operated wire and carbon clamps; particularly designed for use in lamps of moving-picture machines.

1,084,382. Circuit-Closing Device; W. W. Alexandar (deceased), Denver, Col. App. filed July 6, 1910. Highly sensitive circuit-closer operated by vibrations of the track rails.

1,084,384. Brush-Holder for Dynamo-Electric Machines; T. S. Allen, Milwaukee, Wis. App. filed Feb. 28, 1910. Vibration of brushes in high-speed machines is reduced by a weight arranged to increase the inertia of the pressure finger.

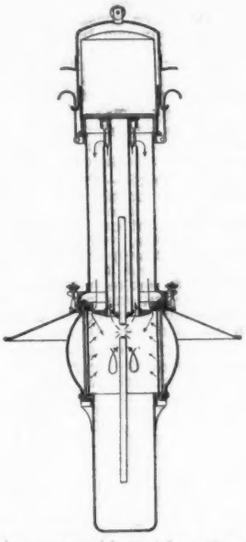
1,084,396. Electromagnetic Switch; E. R. Carichoff, Schenectady, N. Y. App. filed Sept. 11, 1912. Switch is magnetically opened as well as magnetically closed.

1,084,397. Ignition-Indicating Device for Internal-Combustion Engines; A. De Clairmont, Toledo, Ohio. App. filed Dec. 6, 1911. Geisler tubes included in the ignition circuits indicate by flashes of light the firing of the various cylinders.

1,084,466. Electric Furnace; G. Mettler, Berlin, Germany. App. filed Nov. 28, 1911. Resistance furnace which can be continuously charged and uniformly regulated up to temperatures of about 2400 deg. C.

1,084,469. Voltage-Regulating Means; H. Nehlsen, Niederschonhausen, Germany. App. filed Aug. 30, 1912. Employs an induction regulator and a regulating transformer.

1,084,506. Electrically Operated Air Brake; H. L. Tooker, Winslow, Ariz. App. filed June 29, 1911. Electrical control analogous to the ordinary "triple valve."



1,084,551—Inclosed-Electric-Arc Lamp.

1,084,542. Open-Wire-Testing Instrument; C. L. Faries, Phoneton, Ohio. App. filed June 29, 1910. Includes a Wheatstone bridge having both its ratio arms grounded.

1,084,551. Inclosed-Electric-Arc Lamp; M. Korting, Leipzig, Germany. App. filed Dec. 5, 1910. Depositing space or chamber is situated above the combustion chamber.

1,084,556. Electrolytic Apparatus for the Clarification of Sugar Solutions; H. McCubbin, Lahaina, Hawaii. App. filed Sept. 16, 1911. Solution passed through container within which are electrodes.

1,084,560. Panelboard; R. H. Olley, Syracuse, N. Y. App. filed Feb. 18, 1911. Snap switch directly connected to conductor bars of panelboard.

1,084,589. Electric Meter; G. M. Willis, Chicago, Ill. App. filed Nov. 27, 1908. Wattmeter with special features of adjustment.

1,084,590. Electric Motor; H. L. Zabriskie, Westfield, N. J. App. filed July 15, 1911. Has interconnected brake device and contact member.

1,084,594. Induction Generator; F. E. Norton and F. A. Wilson, Nahant, Mass. App. filed Dec. 1, 1911. Development of the Thompson water-dropping collector or electrometer; has inductors, means for charging same, insulating walls forming a vapor channel and collectors exposed in said channel.